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간호학박사 학위논문

**Effects of physical exercise program using
self-efficacy resources for family
caregivers of persons with dementia**

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Abstract

The number of persons with dementia is increasing, and due to the extended life span of dementia patients, it leads to longer periods of caregiving and increased level of caregiving burden. It has been reported that most people who are in mild to moderate severity of dementia live at home and are taken care by their families. The main caregivers are usually spouses, who also tend to be older adults, so the risk of physical and psychological burden increases. Since the health of the persons with dementia is closely related to the health of the caregiver, an intervention is needed for the health care of family caregivers of persons with dementia.

The purpose of this study is to develop and provide a physical exercise program using the sources that increase self-efficacy for family caregivers of persons with dementia living in the community and to evaluate its effectiveness. The program was developed based on Bandura's theory of self-efficacy and modified to reflect the content validity and advice from the expert group.

This study was a nonequivalent control group pretest-posttest design. The subjects were the family caregivers of persons with dementia who were over 60 years old, a total of 64 family caregivers participated in the study; 34 in the experimental group and 30 in the control group. The experimental group was given a weekly, 60-minute physical exercise program for eight weeks, and the control group was given usual care and allowed to voluntarily

participate after the experimental group was done.

Self-Rated Abilities for Health Practices (SRAHP), Exercise Self-Efficacy Scale (ESES), Short Physical Performance Battery (SPPB), Korean version of Zarit Burden Interview (K-ZBI), Geriatric Depression Scale: Short form – Korea version (GDSSF-K), Perceived Stress Scale (PSS) and Korean version of World Health Organization Quality of Life – BREF (K-WHOQOL-BREF) were used to evaluate the program effect. Data were analyzed using descriptive statistics, χ^2 test, Fisher's exact test, independent t-test, and Mann-Whitney U-test using SPSS IBM Statistics Program 23.0.

The results showed that at completion of the program experimental group showed significantly higher level of self-care self-efficacy ($p<.001$), exercise self-efficacy ($p=.001$), physical function ($p<.001$), health-related quality of life ($p=.011$) and significantly lower level of caregiving burden ($p<.001$) and depressive symptoms ($p<.001$). However, perceived stress did not decrease significantly.

In conclusion, exercise program composed of self-efficacy resources can be applied to improve self-care self-efficacy, exercise self-efficacy, physical function, caregiving burden, depressive symptoms and health-related quality of life to family caregivers of persons with dementia living in the community. It has been found to be effective and feasible in clinical settings.

Keywords: Dementia, Family caregivers, Aged, Exercise, Self-efficacy

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I. Introduction

1. Background

South Korea ranks among one of the fastest aging countries. In 2017, those over 65 years of age comprised 13.9% (7.17 million) of the total population. This figure is estimated to be 46.4% (18.2 million) by 2067 (Statistics Korea, 2017), making South Korea the second fastest aging country in the world (United Nations, 2015). The number of persons with dementia (PwD) is also increasing due to the trend of rapid growth in the elderly population. In 2018, the number of PwD in Korea has been reported to be around 750,000 which was increased by 78% compared to the number in 2008. It is expected to exceed one million in 2024, and reach 3.03 million in 2050 (National Institute of Dementia, 2018).

PwD feels most emotionally secure when they live in their most familiar places, such as their own home (Lee, Lee, & Lee, 2015), and it also minimizes their behavioral and psychological symptoms (Jeong, Lee, Hwang, & Youn, 2010). Most of the PwD with less than moderate severity are living at home, and about 60% of the PwD reported that they are being taken care by their family (Kim et al., 2011). If the PwD is being taken care of at home, the family caregiver has to wash, feed, lift and move the PwD by themselves. So, the family caregivers report that they feel physically exhausted and that their perceived health is poor (Bang & Kim, 2016; Lee et al., 2015). They feel the

lack of time to rest, sleep and exercise, and their mortality rate is increased (Hirano, Umegaki, Suzuki, Hayashi, & Kuzuya, 2016; Schulz & Beach, 1999).

About 40% of the caregivers of PwD experience severe level of psychological and physical burden, and their health-related quality of life deteriorating due to stress (Kishita, Hammond, Dietrich, & Mioshi, 2018). 15% of the caregivers of PwD reported moderate to severe levels of depressive symptoms (Jennings et al., 2015), but they also have physical problems such as high prevalence of hypertension (Shaw et al., 1999), decreased immunity (Bauer et al., 2000) and high mortality rates (Schulz & Beach, 1999). Thus, caregivers have the potential to become ‘hidden patients’ or ‘secondary patients’ (Lee & Kim, 2017).

Researchers who have been studying dementia concluded that the health of PwD and the health of their caregiver is closely related, so an intervention program for caregiver’s health is in need to benefit both of them (Lee et al., 2015). Therefore, the health of a caregiver of PwD is an important nursing issue as much as caring for the PwD.

In many previous studies, regular physical exercise has been shown to relieve stress, eliminate anxiety and depressive symptoms, and it is effective in converting unstable emotions to a stable emotional state (Loi et al., 2014; Schuch, Vancampfort, et al., 2016). Physical exercise also helps to avoid or postpone the onset of chronic diseases such as cardiovascular disease (Schuch, Deslandes, et al., 2016), obesity (Sung, 2018), hypertension (Herrod et al., 2018), diabetes (Park, 2016) and osteoporosis (McMillan, Zengin, Ebeling,

& Scott, 2017), which have a high prevalence rate among elderly population, and it also reduces mortality (Warburton, Nicol, & Bredin, 2006).

However, only about 34.4% of the older adults (65 years and older) perform physical exercise (Statistics Korea, 2018), and the intervention program for caregivers of PwD is focused on educational and psychological support (Kishita et al., 2018; Tak, Song, Woo, & An, 2019). Educational and psychological support is essential but it is only needed intermittently in the early stages. Nursing interventions are needed beyond education and counseling, to help protect the health of the family caregiver over a longer period of care, ranging from 8 months to 15 years, to improve their physical health (Kwon, 2019).

Increase in the level of physical exercise and self-efficacy has been proven to be significantly positively correlated in previous studies (Peterson et al., 2008). Exercise self-efficacy is one's perception of his or her belief that one can successfully carry out a planned exercise. It is an important predictor of the initiation and performance of physical exercise (Bandura, 1986). There are only a few intervention with physical activities and exercise for the family caregivers of PwD, especially utilizing self-efficacy resources. Theory-based self-efficacy resources were strategically used for content mapping of physical exercise program of this study. Previous studies of physical exercise intervention for caregivers utilized home-based (Chan et al., 2016), telephone-based (Connell & Janevic, 2009) or a dyad intervention pairing with the PwD (Lamotte, Shah, Lazarov, & Corcos, 2017) due to the condition

of not being able to leave the PwD by themselves at home.

Therefore, this study aims to develop and evaluate the effects of a physical exercise program delivered in-person using the self-efficacy resources for family caregivers of the PwD.

2. Purpose of the Study

The aim of this study is to develop and evaluate the effects of the Physical Exercise using Self-Efficacy Resources (PE-SER) program for family caregivers of the PwD living in the community, the specific aims are the following.

- 1) To develop a PE-SER program for the family caregivers of the PwD living in the community.
- 2) To examine the effects of a PE-SER program for family caregivers of the PwD on their self-efficacy (i.e., self-care self-efficacy and exercise self-efficacy).
- 3) To examine the PE-SER program effects for family caregivers of the PwD on their health outcomes (i.e., physical function, caregiving burden, depressive symptoms, perceived stress and health-related quality of life).

3. Definition of Terms

1) Family caregiver

Theoretical definition: Family caregiver is defined as one of the family member who is mainly responsible for the PwD and providing most of the care.

Operational definition: In this study, a family caregiver is a family member aged 60 and older and taking care of a PwD who has been diagnosed with dementia by a physician and registered at the dementia care center.

2) Physical Exercise using Self-Efficacy Resources (PE-SER) program

Theoretical definition: PE-SER program is a planned, structured, repetitive, physical exercise with a goal of maintaining and promoting health (Melillo et al., 1996).

Operational definition: In this study, the PE-SER program is a 60-minute session per week for eight weeks that the researcher developed using the four self-efficacy resources based on the theory of self-efficacy (Bandura, 1997).

3) Self-efficacy

Theoretical definition: Self-efficacy is a concept introduced by Bandura's theory of self-efficacy (1977) and it refers to a perceived belief in the individual's ability to perform successfully. And task-specific self-efficacy

refers to that one is able perform the task in specific situations (Bandura, 1997). Self-care self-efficacy is a belief that the individual believes in him/herself that he/she can perform self-care. Exercise self-efficacy is the level of confidence that one can be physically active by overcoming the barriers.

Operational definition: In this study, self-care self-efficacy was measured using the Self-Rated Abilities for Health Practices scale (SRAHP) (Becker, Stuijbergen, Oh, & Hall, 1993) that is translated in Korean (Choi, 2004).

Operational definition: In this study, exercise self-efficacy was measured using the Exercise Self-Efficacy Scale (ESES) (Bandura, 1997) that is translated in Korean (Shin, Jang, & Pender, 2001).

4) Physical function

Theoretical definition: Physical function is the capacity to perform activities that are essential for an individual to live (Katz, Ford, & Moskowitz, 1963).

Operational definition: In this study, physical function was measured using the Short Physical Performance Battery (SPPB) (Guralnik et al., 1994).

5) Caregiving burden

Theoretical definition: Caregiving burden is a degree of physical, emotional, financial, social difficulties and discomfort experienced by the family caregiver in relation to situations and events due to the behavioral,

psychological symptoms and cognitive function of the PwD (Zarit, Reever, & Bach-Peterson, 1980).

Operational definition: In this study, caregiving burden was measured using the Korean version of Zarit Burden Interview (ZBI-K) (Bae et al., 2006; Zarit, Todd, & Zarit, 1986).

6) Depressive symptom

Theoretical definition: Depressive symptom is a persistent manifestation of symptoms such as hopelessness, instability, depressed mood and sadness, with reduced interest or enjoyment of usual activities (American Psychiatric Association, 2000).

Operational definition: In this study, the level of depressive symptom was measured using the Geriatric Depression Scale Short Form – Korea version (GDSSF-K) (Ki, 1996; Yesavage & Sheikh, 1986).

7) Perceived Stress

Theoretical definition: Perceived stress is a specific relationship between an individual and the environment that exceeds the resource limitations of an individual and is assessed to be threatened by his/her well-being (Lazarus & Folkman, 1984).

Operational definition: In this study, perceived stress level was measured using the Perceived Stress Scale (PSS) translated in Korean (Cohen, Kamarck, & Mermelstein, 1983).

8) Health-related quality of life

Theoretical definition: Health-related quality of life is the subjective assessment and satisfaction of the individual's life in various domains, including health issues (Ferrell, Wisdom, & Wenzl, 1989).

Operational definition: In this study, the level of health-related quality of life was measured using the K-WHOQOL-BREF (Korean version of World Health Organization Quality of Life - BREF) (World Health Organization, 1998).

II. Literature Review

This study is to develop the PE-SER program for the family caregivers of the PwD living in the community, the literature review was divided into four parts; Psychological and physical health of family caregivers of PwD, Effects of physical exercise in older adults, Physical exercise intervention for caregivers, and Self-efficacy and physical exercise.

1. Psychological and Physical Health of Family Caregivers of Persons with Dementia

Dementia is a neurocognitive disorder with Alzheimer's disease being the most common type. Dementia is characterized generally by progressive cognitive and functional impairment such as loss of short and long-term memory, abstract thinking, language function, and judgment, which may cause significant impairment in daily life and interpersonal relationship (Benke et al., 2013). These symptoms are called Behavioral and Psychological Symptoms in Dementia; BPSD (Finkel, 2000). During their illness, BPSD is seen in almost all (75-80%) of the PwD, irrespective of the form of dementia and the length of the disease. (Borsje, Wetzels, Lucassen, Pot, & Koopmans, 2014). If left untreated, cognitive and daily functions can deteriorate, cause long-term hospitalization and increase medical costs (Cooper, Sommerlad, Lyketsos, & Livingston, 2015; Gitlin et al., 2016).

Due to nuclearization of the family and increased number of working women and aging of the family caregivers, the number of spouses are increasing as the main family caregiver (Tak et al., 2019). When a family member is diagnosed with dementia, one of the family member becomes the main caregiver of the PwD. Suddenly, the main caregiver's daily life pattern stops or it is limited to take care of the PwD. This situation which is not known when it will end, not only creates chronic caregiving burden, but also increases fatigue, physical strain and depressive symptoms (Sung, Yi, Lee, & Jang, 2013). Since the spouse him/herself is usually an older adult who is not much different from the PwD also has health concerns. And considering that most of the family caregivers in Korea are women, followed by spouse (32%), daughter (30%), and daughter-in-law (21%), they show high levels of physical and psychological burden (Oh & Sok, 2009).

Caregiving burden experienced by family caregiver is significantly related to depressive symptoms, anxiety, stress, and deterioration of physical function of PwD (Kang, Yeun, & Jeon, 2014; Springate & Tremont, 2014; Stalder et al., 2014). When PwD's cognitive impairment and BPSD becomes worse, caregivers are more prone to experience physical and psychological problems such as headaches, digestive burden, chest pain, sleep disturbances, and depression resulting in a lower psychological and physical health level (Huang, Lee, Liao, Wang, & Lai, 2012; Shim, Kang, Kim, & Kim, 2016).

In 2017, Moon administration implemented national level dementia treatment support (Ministry of Health and Welfare, 2017) to lift these physical

and psychological burden off of family caregivers. Even though, up to 40% of the caregivers of PwD report experiencing caregiving burden (Adelman, Tmanova, Delgado, Dion, & Lachs, 2014).

Factors of increased caregiving burden includes the caregiver being female, older, living with the PwD, when the caregiving period is longer (Yu, Wang, He, Liang, & Zhou, 2015), having diminished physical health, feelings of ‘not having a choice’ in becoming the caregiver (Lee et al., 2015), PwD’s cognitive function level, abilities to perform activities of daily living, and the severity of BPSD (Varela, Varona, Anderson, & Sansoni, 2011). Prolonged caregiving burden has shown to increase psychosocial difficulties such as depressive symptoms, fatigue and decrease the quality of care, which may directly or indirectly have a negative impact on the PwD (Schaller, Mauskopf, Kriza, Wahlster, & Kolominsky-Rabas, 2015; Tak et al., 2019). It may eventually lead the caregiver to abuse the PwD or in severe cases, they may make extreme choices such as committing suicide with the PwD (O'Dwyer, Moyle, Taylor, Creese, & Zimmer-Gembeck, 2016; O'Dwyer, Moyle, Zimmer-Gembeck, & de Leo, 2016). Family caregivers take care of the PwD on an average of 6.7 years if diagnosed before the age of 70 (Wolters et al., 2018). In Korea, family caregivers take care of the PwD on an average of 4.5 years (Sung et al., 2013), and they show high levels of physical and psychological burden (Oh & Sok, 2009).

Family caregivers of PwD have higher risks of mortality due to their decreased physical and psychological health (Cochrane, Goering, & Rogers,

1997). There are also seen as at risk of stress-related illness and deterioration in general health (Gouin, Hantsoo, & Kiecolt-Glaser, 2008). So, the decline of the health of caregiver has been pointed out as a major nursing problem.

Researchers have studied that the health of PwD is closely related to the health of the caregiver. So, an intervention to promote the caregiver's health can benefit both the PwD and the caregiver (Mace & Rabins, 2011). Various intervention for family caregivers of PwD have been studied to decrease their caregiving burden, depressive symptoms, anxiety, perceived stress, and physical symptoms, and to increase their quality of life and self-efficacy. Studies done in Korea include interventions such as family education program (Lee & Kim, 2017), group reminiscence therapy (Song & Jo, 2014), resilience reinforcement program (Bang & Kim, 2016) and yoga program to improve the sense of coherence (Oh, 2016). In other countries cognitive-behavioral therapy (Wilz & Soellner, 2016), web-based intervention (Hopwood et al., 2018), mindfulness-based stress reduction intervention (Brown, Coogle, & Wegelin, 2016) have been conducted.

Caregiving is a dynamic mechanism that is influenced by the severity of the PwD, the caregiver's understanding about the tasks and obligations, and the personality and available resources of caregivers. Such dynamic factors must be addressed when discussing the health effects of the caregiver's role and developing interventions to protect the caregiver's health (Farran et al., 2016). Many of these programs and interventions focused on psychoeducational, skill building, counseling, support groups, psychotherapy,

case management, PwD training, and other multicomponent strategies (Gaugler & Kane, 2015). Positive social interactions and affection have been reported as playing a role in reducing caregiving burden (Rodakowski, Skidmore, Rogers, & Schulz, 2012).

The contents of the program contained information on the process of caregiving, which included understanding dementia, managing BPSD, providing personal care, reducing caregiver stress and burden, identifying and accessing community-based resources. Researchers recommended that more family caregiver programs should be placed within the context of public health in order to have a greater effect on promotion of health and well-being of caregivers (Schulz et al., 2002).

Many different interventions were developed and applied to relieve the depressive symptoms among caregivers of PwD. Recent review has analyzed the effects of education (Jensen, Agbata, Canavan, & McCarthy, 2015) social support such as family support, peer support, support groups, and social network interventions (Dam, de Vugt, Klinkenberg, Verhey, & van Boxtel, 2016), psychological and internet-based interventions (Boots, de Vugt, van Knippenberg, Kempen, & Verhey, 2014) for caregivers of PwD. Though it was clinically meaningful, these interventions only had small effect (Jensen et al., 2015) or inconsistent results (Dam et al., 2016).

2. Effects of Physical Exercise in Older Adults

Physical exercise is a subset of scheduled, organized, repeated and purposive physical activity. It also has a final or intermediate aim to improve or maintain physical fitness (Garber et al., 2011).

Physical exercise has significant health-promoting benefits in adults. Regularly performing physical exercise decreases the risk of cardiovascular diseases, cerebrovascular diseases, hypertension, type-2 diabetes, colon cancer, and breast cancer (Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010). Physical exercise has also been associated with many positive outcomes among older adults, such as preventing functional limitations (Morgan, Virnig, Duque, Abdel-Moty, & deVito, 2004), and dementia by improving cognitive functioning (Centers for Disease Control and Prevention, 2007).

Previous studies have also shown benefits in individuals with depressive symptoms. It was reported to reduce atrial natriuretic peptide and brain natriuretic peptide, and increase copeptin and growth hormone among persons with depressive symptoms (Schuch, Vancampfort, et al., 2016). Recent meta-analysis found a broad and important impact of physical exercise on depression (Schuch, Vancampfort, et al., 2016). Evidence suggests that physical exercise also improves individuals' mood, psychological and social sense of wellbeing by normalizing the brain-derived neurotrophic factor levels (Chekroud et al., 2018; de Fazio et al., 2015). It modifies the serotonin

function and releases endogenous opioids (Stathopoulou, Powers, Berry, Smits, & Otto, 2006). Physical exercise at any age and regardless of their past history of physical activity appears to confer substantial benefits (Sherwood & Jeffery, 2000).

Physical exercise's health benefits are well documented, higher levels and frequency of physical exercise is associated with reduced risk and improved health (Musich, Wang, Hawkins, & Greame, 2017). The activity level that the American College of Sports Medicine and the Centers for Disease Control and Prevention (2019) recently recommended is a total of 30 minutes of moderate to vigorous exercise, five days a week. Performance of physical activity decreases with age and women experience a greater decrease in older age groups than men (Caspersen & Merritt, 1995). World Health Organization recommends performing both aerobic exercise and muscle strengthening exercise, and also balancing exercise to reduce the risk of fall (2019).

Positive health behaviors, such as physical exercise, can compensate for some of the negative outcomes (Connell & Gallant, 1999). Even with all the benefits of physical exercise, a survey conducted by the World Health Organization with approximately 1.9 million people in 168 countries found that 27.5 percent of adults performed physical exercise that were inadequate to maintain their health in 2016; this figure was not statistically different from 28.5 percent in the 2001 report (Guthold, Stevens, Riley, & Bull, 2018). In Korea, only 34.4% (a little over 3 older adults out of 10) of older adults aged 65 years and older were reported to perform physical exercise (Statistics

Korea, 2018). This study shows that lack of physical exercise in adults is a global issue. Intervention aimed to increase the performance of physical exercise in older adults is important for the prevention of chronic diseases and the enhancement of motor function.

Lack of physical exercise is associated with the changes in body composition which lead to an increase in body fat percentage and a consequent reduction in lean body mass. Consequently, there is a significant loss in maximal force production. Skeletal muscle atrophy is also viewed as a sign of aging and lack of physical exercise. Sarcopenia is characterized as low muscle mass with low muscle strength and/or decreased level of physical activity and exercise (Cruz-Jentoft et al., 2010). As a result, decreased level of physical exercise and reliance on activities of daily living are more frequently seen in older adults (Sjölund, Wimo, Engström, & von Strauss, 2015). Nevertheless, muscle strengthening exercise has been shown to raise lean body mass (Peterson, Sen, & Gordon, 2011), enhance physical performance (Lopez et al., 2018), and have a beneficial impact on self-reported daily living activities (Giné-Garriga, Roqué-Fíguls, Coll-Planas, Sitja-Rabert, & Salvà, 2014).

Participation in physical exercise can help sustain the quality of life, health, physical function and decrease the risk of fall in general, especially older people (Tricco et al., 2017). The increased interest to the relationship between physical exercise and health-related quality of life in older adults indicated that physical exercise increases physical function, and health-

related quality of life in older community-dwelling adults (Kelley, Kelley, Hootman, & Jones, 2009). In order to reduce falls, it is also advised that balance exercise to be included in physical exercise programs for elderly population (Chodzko-Zajko et al., 2009).

3. Physical Exercise Intervention for Caregivers

The health of the family caregivers can be promoted by changing their self-care behaviors, such as performing physical exercise (Gallant & Connell, 2003). Despite the evidence of many benefits of physical exercise, most caregivers do not engage in the advised level of physical activity (Gallant & Connell, 1998).

Previous observational studies evaluating the amount of physical activity in caregivers have generally shown that caregivers perform less physical activity than the non-caregivers. Caregivers who perform less physical activity reported more depressive symptoms (Fredman, Bertrand, Martire, Hochberg, & Harris, 2006), burden (Hirano et al., 2011) and worsening of their general psychological health (Gusi, Prieto, Madruga, Garcia, & Gonzalez-Guerrero, 2009) compared to the caregivers who perform more physical activity. It is important for the caregivers of PwD to increase their physical exercise performance to attain positive health outcomes (Centers for Disease Control, 2007). It is also possible that physical exercise is even more

effective for caregivers than for the general population (Puterman et al., 2018).

Various benefits of physical exercise can be particularly related to caregivers, such as performing physical exercise regularly can increase their level of strength and endurance required to perform the caregiver's role, reduce depressive symptoms, perceived stress, fatigue, anxiety, anger, shorten the circuit of negative physiological reactions to chronic stress, improve health-related quality of life and personal control (Etkin, Prohaska, Connell, Edelman, & Hughes, 2008). It is also reported that caregivers who perform moderate intensity physical exercise had less caregiving stress and experienced better quality of sleep (Hirano et al., 2011).

Effects of physical exercise have been reported with endurance exercise (King, Baumann, O'Sullivan, Wilcox, & Castro, 2002), yoga (Waelde, Thompson, & Gallagher-Thompson, 2004), walking (Lowery et al., 2014), and a combination of various physical activities (Hill, Smith, Fearn, Rydberg, & Oliphant, 2007).

To date the literature has identified only a few physical activity and exercise strategies tailored for caregivers with dementia. The most widely used method of physical exercise was fast walking (Connell & Janevic, 2009). Some studies have carried out additional physical exercises to enhance flexibility (Connell & Janevic, 2009; Marsden et al., 2010) by conducting various of movements, such as Tai-Chi and yoga. (Hill et al., 2007).

Most of the interventions were home-based physical exercise programs, physical exercise monitoring and adherence taken into consideration. Diaries

and physical exercise logs were used frequently (Castro, Wilcox, O'sullivan, Baumann, & King, 2002; King et al., 2002), and attendance check were used for group-based physical exercise (Marsden et al., 2010). Study conducted by Connell & Janevic (2009) used telephone counseling, instead of in-person intervention, which the researchers said it was effective in empowering and supporting family caregivers.

Previous studies have shown that PwD caregivers prefer simple, convenient, and affordable physical exercise programs (Farran et al., 2008). Home-based programs tended to be favored rather than group-based programs (King, Rejeski, & Buchner, 1998), nevertheless, most caregivers considered the social element of group-based physical exercise programs to be fun, interesting, and pleasant (Vreugdenhil, Cannell, Davies, & Razay, 2012).

Caregivers also have other certain aspects that restricts the benefits of physical activity. It is possible that the positive psychological benefits of physical exercise in the general population not be observed in the caregivers of PwD, as the stress and burden from the caregiver role may make physical exercise seem as extra load of work and responsibility. Caregivers mentioned that engaging in such programs contradict with their caregiving role and other duties, and that they were concerned to be away from the PwD (Farran et al., 2008).

The physical exercise obstacles identified by older adults and the caregivers of the PwD may include depression (Castro et al., 2002),

disabilities in activities of daily living (Burton, Newsom, Schulz, Hirsch, & German, 1997), loss of interest and motivation (Satariano, Haight, & Tager, 2000), lack of time (Heesch, Brown, & Blanton, 2000), inadequate social support for day-to-day exercise routine (Janevic & Connell, 2004), and low self-care self-efficacy and exercise self-efficacy (Gallant & Connell, 1998). It has been reported that family caregivers of PwD who are older adults face particular challenges with starting and continuing to perform physical exercise (King et al., 2000).

Previous caregivers' physical exercise programs demonstrated that caregivers were able to increase their level of physical exercise, positively impact physical function, and improve psychological health (Connell & Janevic, 2009). It also helped the caregivers to sustain the role as a caregiver and maintain their own health for a longer period of time (Farran et al., 2016).

4. Self-efficacy and Physical Exercise

Self-efficacy is one's confidence in his/her capability to accomplish the required sources of action to satisfy situational needs. Theoretically, it affects the behaviors that individuals want to participate in, the time spent on these tasks and the degree of commitment exhibited in the face of barriers or aversive stimulus (Bandura, 1986). According to Bandura (1977), self-efficacy can change one's behavior to achieve the goal, which ultimately leads to positive results. Self-efficacy predicts the intention to exercise and

many other aspects of physical exercise behavior (McAuley, 1992; Poag-DuCharme & Brawley, 1993).

Recently, the association between self-efficacy and physical exercise has drawn interest due to the fact that increased self-efficacy is hypothesized to cause the behaviors required to develop a habit of performing physical exercise (Bauman et al., 2012; French, Olander, Chisholm, & Mc Sharry, 2014; Rhodes & Pfaeffli, 2010).

There is clear evidence that interventions can improve the performance of physical exercise lasting beyond 12 months in adults aged 55 to 70 years (Hobbs et al., 2013). Self-efficacy is a promising target for physical exercise interventions (Bandura, 1997). Theoretically, many individuals with high levels of exercise self-efficacy are more likely to increase their performance of physical exercise and continue attempts to retain these gains in the presence of difficulties and barriers (Bandura, 1997). Self-efficacy was identified as one of the most reliable determinants of physical exercise in adults in a major systematic review (Bauman et al., 2012). A study limited the research to the participant's mean age of 50 years or above and pointed out that self-efficacy is one of the most reliable determinant of initiating and maintaining physical exercise in this age group (van Stralen, de Vries, Mudde, Bolman, & Lechner, 2009). A longitudinal study also indicated that there is a stronger relationship between self-efficacy and physical exercise behavior in older adults relative to younger adults (Schwarzer & Renner, 2000). The best ways to increase exercise self-efficacy were identified through previous systematic reviews.

These reviews were carried out with non-clinical adult populations younger than 60 years of age (Williams & French, 2011) and in obese people of any generation (Olander et al., 2012). They figured out which behavioral change strategies were most closely correlated with the increase in exercise self-efficacy and the behavior.

Self-efficacy is deemed particularly important in the early stages of physical exercise (McAuley, 1992). In this stage of the program, frequency of the physical exercise is related to one's confidence of their physical ability and their belief that positive consequences will follow if they overcome the barriers when performing physical exercise. In particular, professional instructions on physical exercise that increases self-confidence when performing exercise have positive impact on participant's self-efficacy (Hammer, Bieler, Beyer, & Midtgaard, 2016).

Exercise self-efficacy is also linked with the motivation to exercise (Schwarzer, 2008). In order to improve exercise self-efficacy, one needs to recognize the risks he/she has, expect that performing physical exercise will benefit them, and to experience successful physical exercise sessions (Schwarzer, 2008). Individuals with increased exercise self-efficacy are more likely to regularly perform physical exercise activities, which becomes a routine in daily life (Sherwood & Jeffery, 2000).

A study that confirmed the effects of Pilates in a group of elderly women using Bandura's self-efficacy-enhancing resources (Lee, 2014), and a walking program developed based on Bandura's self-efficacy theory for

women diagnosed with early stage breast cancer showed improvement in fatigue, quality of life, sleep disorders, exercise self-efficacy and also increased their exercise behavior and ability (Wang, Boehmke, Wu, Dickerson, & Fisher, 2011).

Significant increase in physical exercise time and significant decrease in depression was shown in a study that utilized self-efficacy promoting sources in the physical exercise intervention for older adult patients (Resnick, Luisi, & Vogel, 2008). In a study implementing resistance exercise using self-efficacy promoting resources for rehabilitation exercise in patients with heart disease, the experimental group that received the intervention showed higher self-efficacy and performance of resistance than the control group (Millen & Bray, 2009).

Based on the results of the previous studies, interventions that enhance self-efficacy by utilizing self-efficacy resources improves health promoting behavior and increases the behavior performance. Especially, in physical exercise programs, exercise performance was actively promoted and improved physical functions, and ultimately, positive changes were made to the variables that the study measured.

Active participation and performance are required for an effective intervention. Self-efficacy is a major factor of changing behavior to achieve a targeted result. A person with high levels of self-efficacy makes more efforts to change the behavior and sustains the changed behavior for a longer time. Therefore, it is necessary to improve self-efficacy in order to positively

change and maintain personal health behavior. Promoting self-efficacy increases the participation of the interventions, has positive effect on the intervention delivery and improves the health indicators. So, it is important to establish a specific strategy using self-efficacy promoting resources to improve self-efficacy.

III. Conceptual Framework

1. Conceptual Framework

This study is based the theory of self-efficacy. Self-efficacy theory is drawn from Bandura's social cognitive theory. Bandura emphasizes the role of self-efficacy theory and explains that individual cognition is important in the process of determining and performing human (Bandura, 1977, 1986, 1997). This is because humans comprehend the external stimuli collectively and control their environment by themselves. The self-efficacy theory describes self-efficacy as a factor that significantly influences the process by which a person performs an action and derives its results, it implies a belief that an individual can do something well (Bandura, 1977). A person with high self-efficacy level will be able to maintain the behavior by creating an environment in which specific action can be selected and performed to produce a positive result (Bandura, 1977).

In Bandura's theory, self-efficacy is the driving force of human behavior in human interaction with the environment. This self-efficacy increases with four self-efficacy resources: performance accomplishment, vicarious experience, verbal persuasion, emotional arousal. Performance accomplishment is the expectation that an individual's performance of an attempted action to achieve his or her goal can be achieved if it succeeds, and

that if repeated success is achieved, then self-efficacy expectation can arise and appropriate action can be continued. This is the most influential determinant of self-efficacy. The vicarious experience means that the success and failure experience of a similar person is influenced by the individual's self-efficacy, which means that they can improve self-efficacy by observing that others succeed. Verbal persuasion means that a person who is verbally persuaded that he or she will be successful from others will have more self-efficacy and more effort to succeed, thereby inducing a positive behavioral change. Emotional arousal is a method of promoting self-efficacy in anxiety or fear situations and can be used to improve self-efficacy through interventions to eliminate emotional tension on subjective threats (Bandura, 1977).

The self-efficacy theory developed by Bandura (1977) explains that self-efficacy enhancing resources influence self-efficacy and raise self-efficacy, which leads to behavioral change and ultimately produces positive results.

In this study, the intervention combined the four self-efficacy promoting sources of the theory into the program based on the literature review of the intervention program developed by applying Bandura's self-efficacy theory in order to increase compliance with exercise intervention.

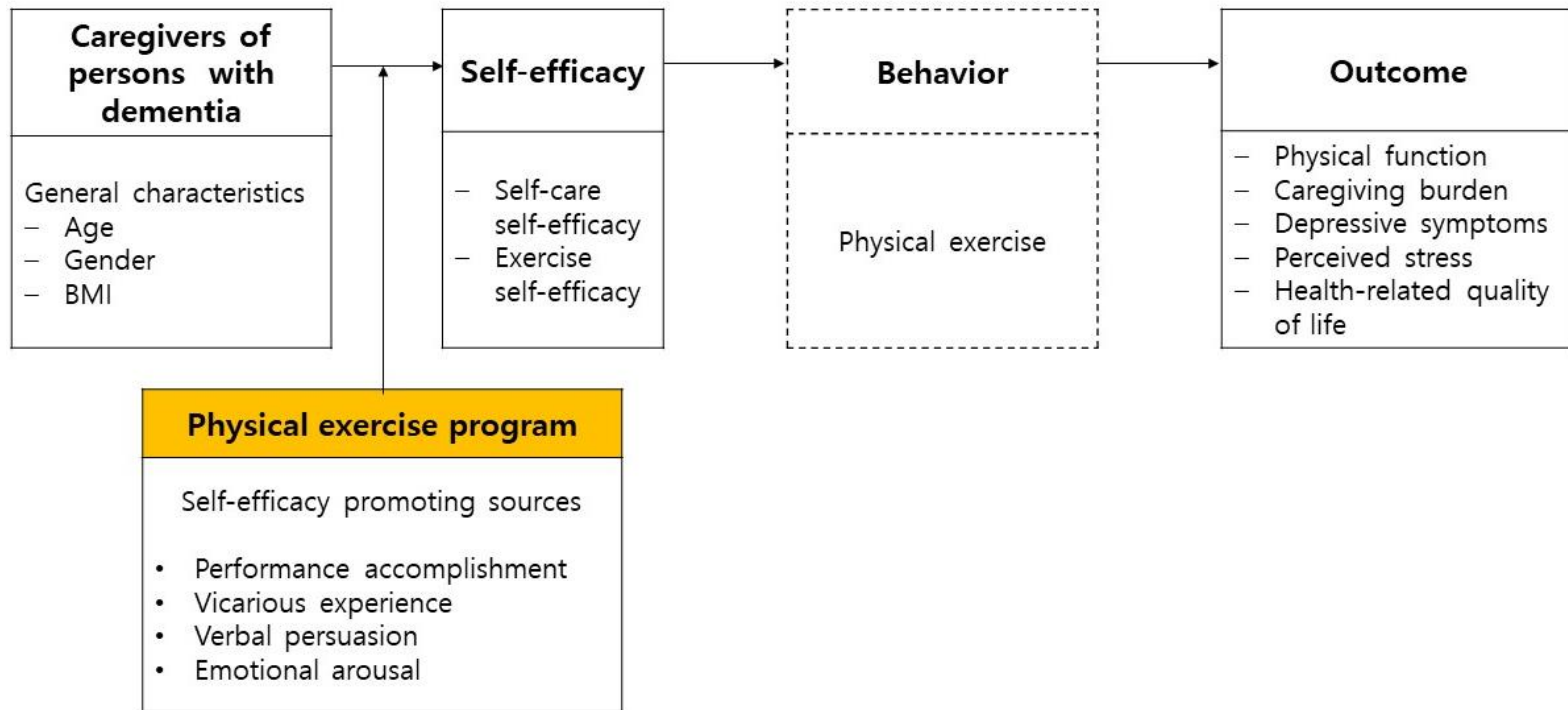


Figure 1. Conceptual framework of the study

2. Research Hypotheses

Based on the theoretical framework, the following are the research hypotheses of this study. The experimental group is the group that participated in the PE-SER program once a week for eight weeks, a total of eight sessions. Control group is the group that was given usual care and able to voluntarily join the PE-SER program after the experimental group was done with their post-test.

Main hypothesis

1. The experimental group participating in the PE-SER program will have a significantly higher self-efficacy (self-care self-efficacy, exercise self-efficacy) score than the control group at completion of the program.

Sub-hypotheses

1. The experimental group participating in the PE-SER program will have significantly higher physical function level than the control group at completion of the program.
2. The experimental group participating in the PE-SER program will have significantly lower level of caregiving burden than the control group at completion of the program.
3. The experimental group participating in the PE-SER program will

have significantly lower level of depressive symptoms than the control group at completion of the program.

4. The experimental group participating in the PE-SER program will have significantly lower level of perceived stress than the control group at completion of the program.
5. The experimental group participating in the PE-SER program will have significantly higher level of health-related quality of life than the control group at completion of the program.

IV. Method

1. Study Design

This study used a pretest-posttest nonequivalent control group design to evaluate the effects of the eight-session PE-SER program for family caregivers of PwD living in the community. Effects on self-care self-efficacy, exercise self-efficacy, physical function, caregiving burden, depressive symptoms, perceived stress, and health-related quality of life were measured.

The experimental group participated in the PE-SER program once a week (60 minutes each session) for eight weeks. The control group was not provided with usual care during the study period; however, they were able to voluntarily participate in the PE-SER program after the post-test.

Table 1. Research Design

Group	T0	Intervention	T2
Experimental	E1	X1	E2
Control	C1		C2

T0: Pre-test

T2: Eight-week post-intervention

E1, C1: General characteristics, Characteristics related to physical exercise program

X1: Physical exercise using self-efficacy resources (PE-SER) program for family caregivers of a persons with dementia

E2, C2: General characteristics, Characteristics related to physical exercise program

2. Participants

The study population of the study is the family caregivers of PwD, who is registered at the national dementia care center. The prospective population is the family caregivers of PwD, who is registered in the dementia care center, and the subject of this study was listed among those who wish to participate in this study. Participants who were willing to participate in the PE-SER program were assigned to the experimental group, and the others were assigned to the control group. The specific inclusion criteria and exclusion criteria are as follows.

1) Inclusion criteria

- A participant who is a family member (60 years and older) living with a relative who have been diagnosed by a physician with Alzheimer's disease or other types of dementia and registered at the dementia care center in Korea
- A participant providing at least 10 hours per week of unpaid care to a relative with dementia
- A participant who does not engage in regular physical exercise (more than twice a week for 30 minutes) during the past three months
- Participants who can communicate properly, follow instructions when exercising, and cooperate with physical measurements
- Participants who have understood the purpose and contents of the

study and agreed to participate

- Participants who can attend all the sessions of the study

2) Exclusion criteria

- A participant who has already participated or planning to participate in other physical exercise programs or research with the purpose of health promotion
- A participant who is suffering from any medical condition or serious physical illness, that limits the participation in light to moderate physical exercise (i.e., walking)

In order to achieve the purpose of this study, statistical power analysis using G*power 3 program was used (Faul, Erdfelder, Lang, & Buchner, 2007). One-tail test, significance level(α) was 0.05, Power ($1-\beta$) 80%, effect size 0.7 (effect size based on an exercise program on self-efficacy and, depression for low-income women aged 75 and older; (K. R. Shin, Kang, Park, & Heitkemper, 2009), 26 participants each in the experimental group and control group, total of 52 subjects. Considering the dropout rate, a total of 68 participants, 34 participants were planned to be recruited in each group.

Potential participants were contacted by either a registered nurse or a social worker who managed the family caregivers at the dementia care center. Total of 74 participants were asked whether they would like to participate in the PE-SER program or not. From the experimental group, two participants

eliminated due to hospitalization, four participants were dropped out due to non-completion of the program and one participant dropped out due to increased caregiving obligations (e.g., decline in PwD health functioning which lead to increase in caregiving responsibilities). Also, three participants dropped out from the control group due to incompleteness of the questionnaire. A total of 64 family caregivers completed the study, 34 participants in the experimental group and 30 participants in the control group.

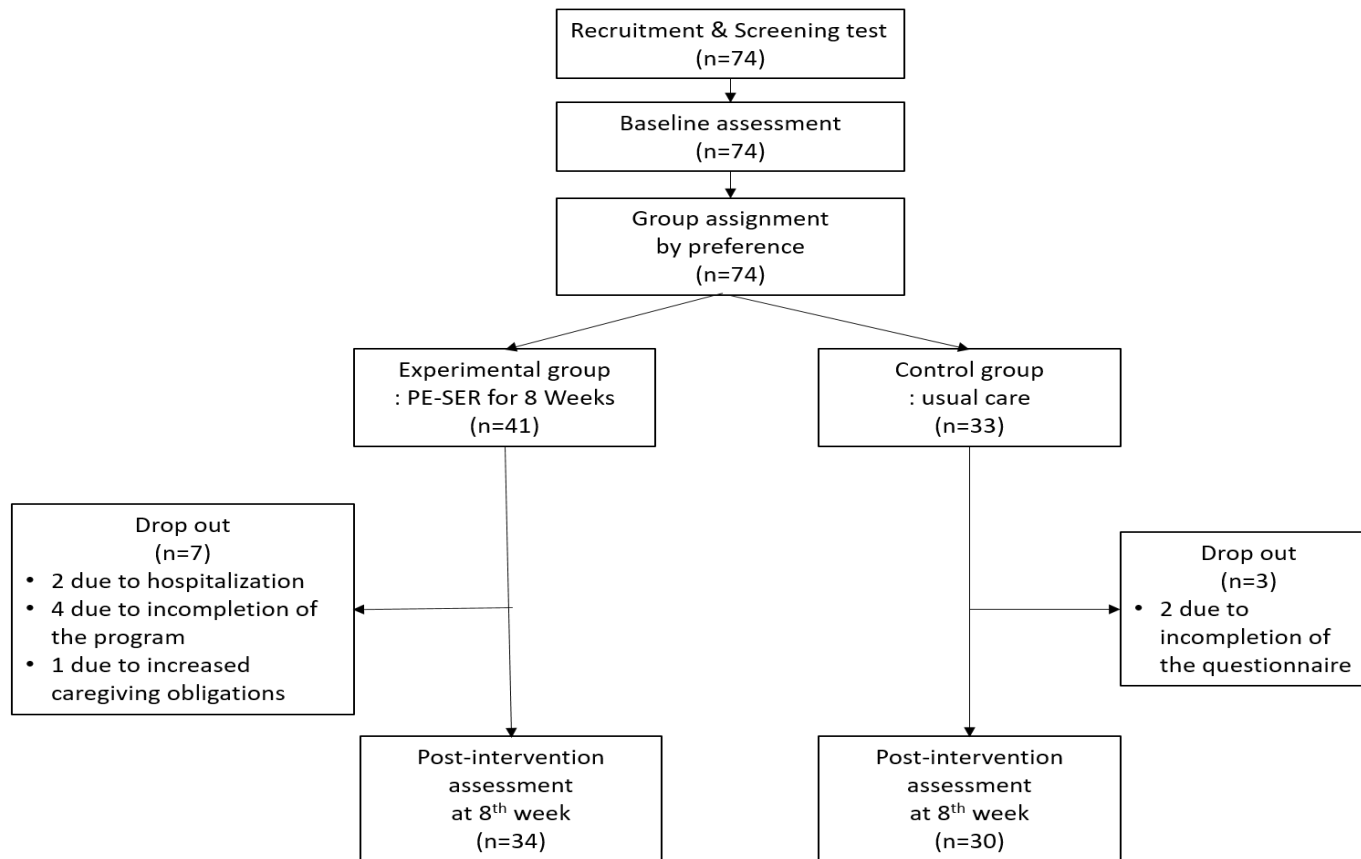


Figure 2. Flow diagram of this study

3) Measurements

All measurements that were used in this study, the original author and translated author of the measurement was contacted for their permission. Dependent variables and measurement tools based on the theoretical framework of this study are as follows.

Table 2. Variables and Empirical Indicators of this Study

Variables	Empirical Indicator	Number of items (score range)	Cronbach's alpha
Self-care self-efficacy	Self-Rated Abilities for Health Practices (SRAHP)	28 (28~112)	.97
Exercise self-efficacy	Exercise Self-Efficacy Scale (ESES)	18 (0~1800)	.96
Physical function	Short Physical Performance Battery (SPPB)	- (0~12)	-
Caregiving burden	Korean version of Zarit Burden Interview (ZBI-K)	22 (0~88)	.93
Depressive symptoms	Geriatric Depression Scale: Short form - Korea Version (GDSSF-K)	15 (0~15)	.88
Perceived stress	Perceived Stress Scale (PSS)	10 (0~40)	.85
Health-related quality of life	Korean version of World Health Organization Quality of Life – BREF (K-WHOQOL-BREF)	26 (26~130)	.95

(1) Family caregiver's demographic characteristics

Family caregiver's demographic characteristics included gender, age, marital status, education, religion, economic status, current occupational status, subjective health status, and the presence of other diseases.

(2) Caregiving-related characteristics

Caregiving-related characteristics included the relationship between the family caregiver and the PwD, whether they live together, the duration in care (total length of time, hours per day), the number of dependent families, availability of an alternative caregiver, and the cost of caring for the PwD per month.

(3) Demographic characteristics of PwD

PwD characteristics were collected (gender, age marital status, education, dementia diagnosis, length of time since diagnosis) at the dementia care center and asked the guardian for further questions such as presence of other diseases.

(4) Behavioral and psychological symptoms of PwD

Behavioral and psychological symptoms of PwD was measured with the Revised - Memory and Behavior Problems Checklist (R-MBPC) (Teri et al., 1992); it is a 24-item questionnaire to measure how often a PwD shows

behavioral and psychological symptoms. R-MBPC was modified from the 30-item developed by Zarit (1982) and translated into Korean (Lee & Yoon, 2007).

This measurement reports the frequency of 24 behavioral and psychological symptoms of PwD by the family caregivers in the last week. It is possible to identify the characteristics of behavioral and psychological symptoms that includes areas such as memory and depressive symptoms. It is a 5-point Likert scale with “0” meaning none and “4” meaning daily. The total score ranges from 0 to 96, higher scores indicate higher frequency of problematic behaviors. The Cronbach’s α of the R-MBPC was 0.95 (Lee & Yoon, 2007) and in this study, Cronbach’s α was 0.93.

(5) Self-care self-efficacy

Self-care self-efficacy was measured using the Self-Rated Abilities for Health Practices (SRAHP); it is a 28-item measurement to measure the specific self-efficacy of health behaviors (Becker et al., 1993). It has been proven to be more powerful than the general self-efficacy tool (Stuifbergen & Becker, 1994). The measurement was translated into Korean and it contains, exercise efficacy, psychological efficacy, nutritional efficacy, and health care efficacy. It is a 4-point Likert scale, total score ranges from 28-112 points. Higher scores indicate higher level of self-care self-efficacy. The reliability of the measurement at the time of development was Cronbach’s α was .82 (Choi, 2004), and in this study, Cronbach’s α was 0.97.

(6) Exercise self-efficacy

Exercise self-efficacy was measured by using the Exercise Self-Efficacy Scale (ESES); it is an 18-item measurement developed by Bandura (1997). ESES was translated into Korean (Shin et al., 2001), the reliability and validity of the measurement were confirmed. Total score ranges from 0 points (cannot do) to 100 points (certainly can do) on a 10-point unit interval, and the higher scores indicate that higher exercise self-efficacy, that individuals can perform physical exercise regularly, no matter what circumstances they face. In Shin et al. (1999) study, Cronbach's α was 0.94, and in this study, Cronbach's α was 0.96.

(7) Physical function

In order to evaluate the physical function, the Short Physical Performance Battery (SPPB) was used, which is consisted of three areas such as 4 meters walking speed, balance and standing from a chair (Guralnik et al., 1994). The SPPB score helps to understand the current physical status as well as their relative risk to ADL (activities of daily living) decline over the next four years.

Gait Speed Test: The walking speed was measured by asking the participants to walk 4 meters, measuring the time twice and recording the time that is shorter. If the participant cannot walk, 0 points was given. If it exceeded 8.70 seconds, it was given 1 point, 6.21~8.70 seconds was given 2 points, 4.82~6.20 seconds was given 3 points and less than 4.82 seconds was given 4 points.

Balance Test: The participant was asked to stand in three different positions for 10 seconds; 1) side by side stand (feet next to each other touching), 2) semi-tandem stand (placing the heel of the one foot around the toe area of the other foot), 3) tandem stand (placing the heel of the one foot against the toes of the other foot). The balance test was given each one point when the normal posture and semi-line posture are maintained for ten seconds or more. When the line posture was held for three to ten seconds, it was calculated as one point; if held for ten seconds or more, it was given two points.

Single Chair Stand Test: The participant was asked to stand up from the chair with their arms crossed on their chest, five times in a row. If the participant was unable to stand up from a chair without using their arms or it took them more than 60 seconds it was counted as zero point; if it took more than 16.70 seconds it was counted as one point; 13.70~16.69 seconds was given two points; 11.20~13.69 seconds was given three points; and if it took less than 11.19 seconds, it was given four points.

The final score was calculated by adding the scores for all three sections, score ranges from 0 to 12 points, higher scores indicate better physical function (Guralnik et al., 1994). The test-retest reliability of this measurement was high (0.87, CI95%: 0.07~0.96 (Gómez, Curcio, Alvarado, Zunzunegui, & Guralnik, 2013).

(8) Caregiving burden

The caregiving burden was measured using the Zarit Burden Interview (ZBI) (Zarit et al., 1980). ZBI was translated into Korean and the validity and reliability were confirmed (Lee et al., 2004). ZBI-K is a 22-item questionnaire that includes domains of health, finance, social life, and interpersonal relationship, with a 5-point Likert scale from “not at all: 0 points” to “always: 4 points”. Score ranges from 0 to 88, higher scores indicate greater caregiving burden. The Cronbach’s α of the ZBI-K was 0.91, and in this study, Cronbach’s α was 0.93.

(9) Depressive symptoms

Depressive symptoms were measured using the Geriatric Depression Scale Short Form – Korea version (GDSSF-K); it is a 15-item questionnaire to measure the symptoms of depression, originally developed by Yesavage and Sheikh (1986), translated into Korean and the validity was confirmed by Ki (1996). Participants were asked to respond to the questionnaire based on their feelings in the last week, “yes=0”, “no=1.” The items asking the positive emotions (item number 2, 7, 8, 11 and 12) was scored reversely. Total score ranges from 0 to 15, one point was assigned to each item. If the total score was less than five, it indicates “normal”; 6 to 9 indicates, “mildly depressed”; and more than ten, indicates “severely depressed” (Yesavage & Sheikh, 1986). In the Study by Yesavage and Sheikh (1986), Cronbach’s α 0.88, and in this study, Cronbach’s α was 0.88.

(10) Perceived stress

Perceived stress was measured using the Perceived Stress Scale (PSS) (Cohen et al., 1983); it is a 10-item questionnaire that measures the degree of perceived personal life that has been unpredictable, uncontrollable, and burdensome over the past month. It is a 5-point Likert scale (0-4), total score ranges from 0 to 40. The negative items are reversed, and the higher scores indicate higher levels of perceived stress. The Cronbach's α of the PSS was 0.78 (Cohen et al., 1983), and in this study, Cronbach's α was 0.85.

(11) Health-related quality of life

The level of health-related quality of life was measured using the K-WHOQOL-BREF (Korean version of World Health Organization Quality of Life - BREF) which is a shortened questionnaire of WHOQOL developed by World Health Organization (1998). K-WHOQOL-BREF is a 26-items questionnaire with four domains related to quality of life: physical health, psychological, social relationships, and environment, with an additional one item on overall general health and quality of life. It is a 5-point Likert scale, total score ranges from 26 to 130; higher scores indicate higher levels of health-related quality of life. The Cronbach's α of the K-WHOQOL-BREF was 0.83, and in this study, Cronbach's α was 0.95.

4) Development of the Physical Exercise using Self-Efficacy Resources (PE-SER) Program

In this study, the PE-SER program was developed for family caregivers of PwD living in the community to perform physical exercise continuously and effectively. Bandura's self-efficacy theory was applied for the strategies and contents of the intervention and its evaluation.

(1) Needs assessment

To assess the needs of the family caregivers of PwD attending the dementia care center, literature review (national and global physical exercise guidelines for older adults, existing physical exercise program, intervention for family caregivers of PwD, identifying their limitations, and physical exercise program that utilized self-efficacy) and a focus group interview was conducted.

Most of the interventions for family caregivers of PwD that have been conducted do not include physical activity and exercise for the purpose of improvement of physical health or to resolve the physical difficulties experienced by the family caregivers of PwD. Nursing intervention for family caregivers of PwD should be constructed in a way that improves both physical and psychological health.

With the help from the dementia care center, seven staff (registered nurses, social workers, and occupational therapist) of the dementia care center were

gathered for the focus group interview. Focus group interview is a method for discovering trends and patterns on a subject through discussion and sharing processes with the aim of listening to the focus group with common characteristics (Krueger & Casey, 2000). Through interview researcher was able to obtain valuable information that was needed when developing the PE-SER program for the family caregivers. Researcher was told that family caregiver's educational level and economical level was diverse, and the family caregivers with higher economic status and education level may tend to be picky and needy. Also, the main characteristic of the participant was that since they are the main caregiver of the PwD, they could only participate in the program when the PwD is at day care or if the PwD could come with them to the dementia care center. So, the staff of the dementia care center has agreed to hold a cognitive activity program for the PwD at the same time when the PE-SER program was conducted for the family caregivers.

It was told that most of the family caregivers completed "Haealim" which is an educational program specifically designed for family caregivers of PwD developed by the national institute of dementia in Korea. Haealim is a program that contains dementia knowledge, caregiving skills, psychological support for the family caregivers. Family caregivers who complete Haealim also has an opportunity to participate in a self-support group. However, the self-support group was utilized as a time for chatting and providing updated information on dementia.

The staff mentioned that the family caregivers are focused on how to take

good care of the PwD, so that they do not give much attention to themselves. Family caregivers have the need to take care of themselves by working out, however, they do not have the time nor the opportunity to perform physical exercise. They also do not have any information or source on what or how to start physical exercise. Staff of the dementia care center asked for the materials and booklets after the research is completed to continually run the PE-SER program even after the study was over. Based on the information from the interview, the contents and composition of the program were modified and restructured (Table 3).

(2) Content validity and expert advice

After drafting the PE-SER program, the appropriateness of the program contents was evaluated by an expert group; one certified strength and conditioning specialist, one occupational therapist, and three registered nurses at the dementia care center. The expert group advice questionnaire was designed to provide opinion on the appropriateness of the overall program configuration, time/length of the program, weekly content, applicability, and any other part to be added or deleted. Content validity test was based on content validity index (CVI) consisting of a 4-point scale (1=not valid, 2=somewhat valid, 3=valid, 4=very valid). The percentage of experts who have rated 3 or 4 points was calculated, and if it was more than 80%, it was adopted. As a result, the overall CVI was 1.00 and all the experts rated the program to be appropriate.

Expert also gave advice to include a detailed explanation for each movement and different types of physical exercise. It was recommended that the physical exercise movements should not require any equipment or supplies, and it should be doable indoors, so it would be more feasible for the family caregivers regardless of the place, time, and weather. For the PE-SER program, a steady chair with arm rails and a supportive back that does not have wheels or the risk of flipping/sliding to eliminate the risk of fall. They also recommended to conduct the discussion as a one big group instead of the small groups when expressing/sharing their feelings about exercising so all the family caregivers could actively participate. They also gave opinion to have a research assistant when conducting the PE-SER program, so when the main researcher is explaining and demonstrating the physical exercise movements, the research assistant can assist the family caregivers with their position and movements. Final draft was revised and modified reflecting the expert's advices.

(3) PE-SER program for the family caregivers of PwD

The purpose of the PE-SER program developed in this study is to improve exercise self-efficacy, promote behavioral changes and maintain the behavior of performing physical exercise in family caregivers who are older and do not regularly exercise.

The PE-SER program was composed of contents based on the literature review of previous studies applying the theory of self-efficacy to identify,

modify, supplement and effectively deliver the appropriate physical exercise and educational contents for family caregivers of PwD. In Connell and Mary's study (2009), Bandura's social cognitive theory was introduced as a useful model for understanding physical exercise performance in family caregivers of PwD. Social cognitive theory suggests that when self-efficacy increases, it changes the behavior to achieve its goal, which ultimately leads to positive results, it emphasizes the importance of the self-efficacy (Bandura, 1977). Previous studies confirming the effectiveness of physical exercise programs suggest that self-efficacy is an important determinant in order to see the effects of physical exercise, and that it is important to develop strategies for the participants to continue exercise (French et al., 2014; McAuley, Lox, & Duncan, 1993).

It was finalized through the verification process of the exercise specialist majored in exercise science and nutrition who is a certified strength and conditioning specialist. PE-SER program is eight weeks long and it was delivered by the researcher. Previous researches have shown positive effects of physical exercise in an eight weeks' program for older adults (Bulat et al., 2007; Singh & Fiatarone Singh, 2000).

① Basic principles of the program

The program has components, and main strategies basically according to the theory of self-efficacy.

In the PE-SER program of this study, components related to the four self-

efficacy resources were: seven related to performance accomplishment (PA), two related to vicarious experience (VE), three related to verbal persuasion (VP), and three related to emotional arousal (EA) to promote physical and psychological health through physical exercise in family caregivers of PwD. Performance accomplishment is the most influential factor of self-efficacy (Bandura, 1977), where the most contents were allocated.

The main strategies of the program include <Goal setting>, <Goal achievement>, <Skills improvement>, <Encouragement>, <Self-monitoring>, <Providing information>, <Persuasion>, and <Motivation> (Table 3). To strengthen <<performance accomplishment>>, <Goal setting>, <Goal achievement>, <Skills improvement>, <Encouragement>, <Self-monitoring> (Artino, 2012; Betz, 1992) and to strengthen <<vicarious experience>>, <Providing information>, <Persuasion> can be an effective behavioral strategy based on previous research. In addition, to reinforce <<verbal persuasion>>, <Providing information> was shown to be effective, to strengthen <<emotional arousal>>, <Motivation>, <Encouragement> and <Persuasion> are an effective action strategies based on previous research (Betz, 1992).

② The contents of the main strategies according to the program components

A. Reinforcement of the performance accomplishment

<Goal setting>, <Goal achievement>, <Skills improvement>,

<Encouragement> and <Self-monitoring> was used for the reinforcement of <<performance accomplishment>>. The strategic contents are as follows. Family caregivers of PwD were asked to plan and set a physical exercise goal for the week to increase their level of exercise self-efficacy. They were encouraged to set a goal that consists at least 30 minutes of physical exercise, three times a week. Family caregivers were also asked to monitor their physical exercise and record it in their physical exercise diary. The researcher checked the family caregiver's physical exercise diary and monitored to see if they have met their set goal. The types and movements of physical exercise for family caregivers of PwD (stretching, balancing, cardiovascular, muscle-strengthening) were introduced and educated for their skills improvement. Encouragement was continuously provided while the family caregivers were exercising. Intervention was delivered by group, individually and via telephone (Table 3).

B. Reinforcement of the vicarious experience

<Providing information>, <Encouragement> and <Persuasion> was used for the reinforcement of <<vicarious experience>>. The strategic contents are as follows. Family caregivers of PwD were asked to share their impression of exercising while participating in the PE-SER program. They were also asked to share information to increase exercise self-efficacy by encouraging other family caregivers. Family caregivers also shared ways to overcome obstacles when exercising. Success stories of older adults who have continued to

exercise was introduced to family caregivers to persuade them to continue exercise. Intervention was delivered by group and telephone (Table 3).

C. Reinforcement of the verbal persuasion

<Providing information> was used for the reinforcement of <<verbal persuasion>>. The strategic contents are as follows. Importance of exercising, precautions when exercising, and suitable physical exercises for older adults was educated. Types and movements of physical exercise for family caregivers of PwD (stretching, balancing, cardiovascular, muscle-strengthening) was also educated. Information on physical and psychosocial changes such as self-care self-efficacy, exercise self-efficacy, perceived stress, depressive symptoms, caregiving burden and health-related quality of life when performing physical exercise was provided. Intervention was delivered by group and telephone (Table 3).

D. Reinforcement of the emotional arousal

<Motivation>, <Encouragement> and <Persuasion> was used for the reinforcement of <<emotional arousal>>. The strategic contents are as follows. Recreation was included in each session before the physical exercise training begun for motivation and relaxation. Family caregivers shared their impressions/feelings while participating in the PE-SER program to motivate and encourage peers about exercising. Intervention was delivered by group and telephone (Table 3).

Table 3. Basic Principles of PE-SER Program for Family Caregivers of PwD

Components	Main strategy	Strategy content	Intervention		
			Group	Individual	Telephone counseling
Performance accomplishment	Goal setting Goal achievement Skills improvement Encouragement Self-monitoring	▪ Goal setting and planning for family caregivers of PwD to increase their level of exercise self-efficacy		x	x
		▪ Monitoring one's physical exercise and recording it in the physical exercise diary		x	x
		▪ Monitoring the physical exercise diary and checking to see if one has met their set goal		x	x
		▪ Educating the types and movements of physical exercise for family caregivers of PwD (stretching, balancing, cardiovascular, muscle-strengthening)	x		
Vicarious experience	Providing information Encouragement Persuasion	▪ Sharing impressions of exercising - Sharing information with others to increase exercise self-efficacy - Sharing success stories of continuing physical exercise - Sharing ways to overcome obstacles when exercising	x		x

Table 3. Basic Principles of PE-SER Program for Family Caregivers of PwD (continued)

Components	Main strategy	Strategy content	Intervention		
			Group	Individual	Telephone counseling
Verbal persuasion	Providing information	<ul style="list-style-type: none"> ▪ Education about physical exercise <ul style="list-style-type: none"> - Education about the importance of exercising and precautions and suitable physical exercise for older adults 	x		x
		<ul style="list-style-type: none"> ▪ Educating the types and movements of physical exercise for family caregivers of PwD (stretching, balancing, cardiovascular, muscle-strengthening) 	x		
		<ul style="list-style-type: none"> ▪ Physical and psychosocial changes such as perceived stress, depression, caring burden etc. when exercising 			
Emotional arousal	Motivation	<ul style="list-style-type: none"> ▪ Recreation before the physical exercise training for motivation 	x		
	Encouragement Persuasion	<ul style="list-style-type: none"> ▪ Sharing impressions of exercising <ul style="list-style-type: none"> - Sharing and encouraging peers about exercising 	x		x

③ Details of the program based on intervention delivery

In this study, the PE-SER program was designed to be applicable to the family caregivers who are available while waiting for their spouse when the PwD are under the care of the dementia care center staff during their cognitive program. As part of the program, group intervention, individual intervention, telephone counseling, text message reminders and physical exercise diary were provided to the family caregivers of PwD. The family caregivers who participated in the program were from three different dementia care centers, two at Gyeonggi-do (one center from I-city, one center from E-city) and one at Incheon (one center from M-gu). Group intervention was conducted from October 22nd, 2019 to December 24th, 2019. The group intervention was conducted in the program room at each dementia care center for 60 minutes every week for eight sessions. Individual intervention was administered for about five minutes before each group intervention begun except for the first session, a total of seven times. Telephone counseling and reminder text message were provided between each session. Telephone counseling lasted around ten minutes, and text message was sent to remind them of the date and time of the PE-SER program and to give them a cue to exercise. Physical exercise diary was given once at the beginning of the group intervention (Table 4). In the beginning of the first session, family caregivers were asked to sign a written agreement that was included in the first page of the physical

exercise diary. It stated that they would actively participate in the PE-SER program, to respect and sincerely listen/sympathize other family caregivers' thoughts, to arrive at the center on time and lastly to practice what they have learned through the PE-SER program (Appendix 5).

Table 4. Program Schedule and Intervention Dosage

Intervention	Dosage		Eight weeks															
	frequency	time	1	1-1	2	2-1	3	3-1	4	4-1	5	5-1	6	6-1	7	7-1	8	
Group	8	60 minutes	●		●		●		●		●		●		●		●	
Individual	8	5 minutes			●		●		●		●		●		●		●	
Telephone counseling	7	5-10 minutes		●		●		●		●		●		●		●		
Reminder text message	8	-		●		●		●		●		●		●		●		
Physical exercise diary	1	-	●															

i. Overview of the program

Specific details of the intervention are as follows (Table 5). In this study, considering the PwD cognitive program schedule and the family caregiver's availability, the PE-SER program was planned to be a 60-minute session, once a week for eight weeks. Each session contained four sections; 1) 10-minutes: checking physical exercise diary and assessing to see if the family caregiver has met their goal, recreation to relax and to feel the sense of security, 2) 30-minutes: physical exercise section, 3) 15-minutes: sharing experience and feelings while exercising, education about physical exercise, 4) 5-minutes: setting goals for next session and recording physical exercise diary (Summary of the physical exercise diary usage is presented in appendix 10).

Table 5. PE-SER Program Contents

Time	Contents	SER
10 mins	<ul style="list-style-type: none"> - checking physical exercise diary - checking to see if the participant has met their goal - recreation to relax and to feel the sense of security 	<div>PA</div> <hr/> <div>EA</div>
30 mins	5 mins Warm-up (national physical exercise)	PA/VP
	Main physical exercise	
	i. Stretching <ul style="list-style-type: none"> - Palm grasp / Finger grasp - Neck stretch - Raising shoulders / Turning shoulders - Body twist - Leg stretches 	
	2) Balancing <ul style="list-style-type: none"> - Leg open - Narrow walking / Wide walking - Walking in line 	
20 mins	3) Cardiovascular	PA/VP
	<ul style="list-style-type: none"> - Marching in place / Running in place - Hip march - Rowing - Elbow to knee cross - Jumping jack 	
	4) Muscle-strengthening	
	<ul style="list-style-type: none"> - Shoulder movement - Chest movement - Leg movement - Squat - Knee bends - Trunk bending - Shoulder raise / Arm raise / Leg raise 	
5 mins Wrap-up (Stretching)		
15 mins	<ul style="list-style-type: none"> - sharing experience and feelings while exercising - education about physical exercise (lecture) 	<div>VE/EA</div> <hr/> <div>VP</div>
5 mins	<ul style="list-style-type: none"> - setting goals for the next session - recording physical exercise diary 	PA

SER: self-efficacy resource; PA: performance accomplishment;
 EA: emotional arousal; VP: verbal persuasion; VE: vicarious experience

ii. Details of the program via group intervention

Specific details of the group intervention are as follows (Table 5). Recreation time was held before each physical exercise intervention. Initial games, nonsense games and quizzes were created with the theme of physical exercise, self-efficacy, and caregivers of PwD. Family caregivers who got the correct answer received a small token. Recreation time was hold before the physical exercise intervention, to make the family caregivers feel relaxed, secured, and motivated to exercise.

The 30-minute physical exercise regimen was included after the recreation each session. World Health Organization (WHO) recommended physical exercise guideline for older adults 65 years and above is at least 150 mins of moderate-intensity aerobic exercise throughout the week / physical exercise to enhance balance three or more days per week / muscle-strengthening activities two or more days a week (WHO, 2019). Every physical exercise session started with a warm-up using the video clip of Korean national physical exercise and ended with the wrap-up using the video clip of stretching movements. In the 20-minute main physical exercise session, stretching, balancing, cardiovascular and muscle-strengthening exercise movements were included. The Main exercise included the movements listed in table 5. In session one, all the stretching and balancing movements were educated. In session two, part of stretching and balancing movements was reviewed, and all cardiovascular movements were educated. In session three,

part of stretching, balancing and cardiovascular movements were reviewed, and all muscle-strengthening movements were introduced. From session four to eight, parts of all movements were included in each session.

After the physical exercise intervention, education on physical exercise was given. Specific educational contents that was given as a lecture each session for 10-minutes are listed in table 6. Educational contents were mostly topics about the importance and necessity of physical exercise to provide information and persuade the family caregivers of PwD. Due to the family caregivers' age education on precautions and appropriate physical exercises suitable for older adults was lectured. PowerPoint lecture slides and video clips were utilized.

Family caregivers of PwD were asked to share their experience and feelings while exercising. To increase their exercise self-efficacy discussion were focused on sharing information, success stories of continuing exercise and how to overcome obstacles when exercising. Family caregivers took turns every session sharing their impressions after the education on physical exercise.

Table 6. Specific Contents on Education for Family Caregivers

Session	Contents
1	Definition of physical exercise & types and movements of physical exercise
2	Benefits and importance of exercising & How to overcome barriers of exercising
3	Appropriate physical exercise and precautions of exercising in older adults
4	Necessity and importance of muscle strengthening exercise
5	Prevention of five main geriatric syndrome (frailty, sarcopenia, falls, incontinence, gait disorder)
6	Appropriate posture and correct ways of walking
7	Caregiver's health information & Ways to manage caregiving stress
8	Wrap-up session

iii. Details of the program via individual intervention

Specific details of the individual intervention are as follows. Family caregiver was asked to record their physical exercise log on their physical exercise diary and to set a goal for the week. Actionable goal setting is an effective strategy for self-management in older adults (Munshi, Maguchi, & Segal, 2012). Researcher were available when the family caregivers needed help. In the physical exercise diary, figures of each movements and easy to read instructions were included, so, the family caregiver could perform physical exercise on their own at home.

The following week, researcher checked the participant's physical exercise diary before or after the scheduled physical exercise sessions to see if the participants has met their goal that they have set last week. If the participant has met their goal, researcher provided positive reinforcement and encouraged them to keep up the good work. If the participant were not able to record or fell below their set goal, problem solving was individually provided to overcome the barriers and they were motivated to exercise.

iv. Details of the program via telephone counseling intervention

Specific details of the telephone counseling intervention are as follows. Telephone counseling is a cost-effective method and it is widely used in self-care programs for chronically ill patients in the community. Usually, telephone counseling is used to provide support and advice to promote health behavior and self-care (McLean, Protti, & Sheikh, 2011).

Telephone counseling was conducted in between group intervention by the researcher for about 5-10 minutes. The researcher also checked if the family caregiver had any pain or discomfort after the physical exercise intervention. The researcher also checked if the family caregiver was exercising at home, if they had any barriers when exercising or recording the physical exercise diary. Lastly, researcher asked the family caregiver how they feel about exercising and the PE-SER program that they could not share with another family caregiver.

5) Data Collection

In this study, the participants of the study were recruited from three different dementia care centers. Dementia care centers were contacted by the researcher for their cooperation and permission to provide the PE-SER program. Three centers agreed to participate. These three center did provide an educational program for the family caregivers to teach them how to take care of the PwD and their caregiving burden however, they did not have a program to educate them how to take care of their own physical health or a physical exercise program.

Before conducting the study, the purpose and method of the study was explained to the director and staff of the dementia care center and asked for their cooperation and permission for research in writing. With the help from the dementia care center, PwD registered at the center who are living with their family in the community was identified and their demographic information was collected. PwD living alone, living with a certified care worker or a housemaid was excluded. The family caregivers were contacted by telephone to explain the purpose, contents, procedure of the study and those who wish to participate was recruited.

The schedule of the PE-SER program matched the cognitive program schedule of the PwD. This was because the family caregiver could participate in the PE-SER program when the PwD visits the dementia care center for their cognitive program. Then the PwD is under the care of an RN or

occupational therapist.

Both the experimental and control group used the same measurements to assess pre- and post-test at the same time. In order to maintain the objectivity of the data, research assistants who helped with the questionnaire were those who did not participate in the study.

The main researcher educated and trained the research assistants who collected data twice, once before pre-test and once before post-test as a reminder. The training contained information on ethical considerations, purpose of the study, study contents, procedure, how to measure the physical health indicators and instructions on how to fill out the questionnaire. The questionnaire was read if the family caregiver asked for help. Research assistants were not able to identify which group the participant belonged to.

6) Data Analysis

The collected data was analyzed using the SPSS IBM statistics program version 23.0 as follows.

- General characteristics of the subjects and continuous variables was summarized using descriptive statistics of frequency, percentage, mean and standard deviation.
- The normality of each variable was tested using the Shapiro-Wilk test.
- Comparison of baseline characteristics between the control and experimental group was performed using Chi-square test (for categorical variables), independent *t*-test (for normally distributed variables), or Mann-Whitney U test (for non-normally distributed continuous variables).
- The differences between pre- and post-intervention scores (delta scores) of the baseline and outcome scores was calculated for each assessment scale. To compare delta scores between the control and experimental group, the Wilcoxon signed ranked tests and Mann-Whitney U tests was used, respectively.
- A two-sided statistical significance level of $p < .05$ was set.

7) Researcher Preparation

The researcher is currently working at the Seoul Metropolitan Dementia Center as a researcher and has actively participated in the study to develop an integrative activity program for older adults with mild dementia. In 2016, she also applied the developed a program for older adults with low education and mild dementia over twelve weeks at N district elderly welfare center in Seoul.

The researcher has also lectured at dementia specialized education on topics of “Understanding dementia family”, “Dementia family support service”, and "Utilization of services for a persons with dementia” that is conducted by National Health Insurance Service since 2017.

In addition, she took courses related to the older adults to develop and operate programs such as gerontological nursing seminar, health promotion for older adults, seminar in stress response management, stress and wellness, and advanced exercise nursing.

8) Ethical Considerations

Data was collected after this study was reviewed and approved by Seoul National University Institutional Review Board (IRB) to protect the safety and human rights of the participants. In addition, after obtaining the consent for the research from three dementia care centers, a written agreement was acquired before the study begun.

All participants received a written consent form approved by the IRB and the purpose of the study, anonymity, confidentiality of the participant, and that withdrawal from the study was possible whenever they wanted was explained. The researcher explained in detail verbally and in writing. After receiving the written consent, data collection begun.

Access to all collected data was limited to the researcher herself, and all personal information was kept strictly confidential.

In order to prevent leakage of personal information, questionnaire contents and to ensure confidentiality, questionnaire data was anonymously coded immediately upon collection. It was not utilized for the purpose other than research. After the completion of the study, it was discarded by shredding or incineration.

The researcher coded all the data herself and the data was stored in a locked cabinet, making it inaccessible to other than herself. After data collection and intervention, both the experimental group and control group was provided with a small gift of appreciation worth 10,000 won for their

participation in the study. The control group was provided with usual care and was able to voluntarily participate in the PE-SER program after the experimental group has completed their post-test.

Although this PE-SER program did not appear to cause any major medical problems for the family caregivers of PwD, just in case there was an unexpected accident during the program, a registered nurse and emergency medical treatment was available, and the emergency room transfer system was equipped.

V. Results

1. Evaluation of the Physical Exercise using Self-Efficacy Resources Program

1) Participants normality test

Shapiro-Wilk test was performed for the normality test, considering that the number of subjects in the experimental group were less than 30 (Table 7). As a result, the general characteristics of the subjects and characteristics of PwD showed that age and education level satisfied normality. In dependent variables, only Exercise Self-Efficacy Scale (ESES), Korean version of Zarit Burden Interview (ZBI-K), and Perceived Stress Scale (PSS) satisfied normality. Independent t-test were used for the variables that followed normality. The followings are that did not follow normality; caregiving related characteristics (total length of caregiving time, hours of caregiving per day and cost of caring the PwD per month, Revised – Memory and Behavior Problems Checklist (R-MBPC)), dependent variables (Self-Rated Abilities for Health Practices (SRAHP), Geriatric Depression Scale: Short form – Korea version (GDSSF-K), Korean version of World Health Organization of Life-BREF (K-WHOQOL-BREF) and Short Physical Performance Battery (SPPB)). For the variables that did not satisfy normality, statistical analysis was performed using Mann-Whitney U test, a nonparametric analysis method.

Table 7. Normality Test of Continuous Variables

Categories	Characteristics	Shapiro- Wilk test
		<i>p</i>
General Characteristics	Age (years)	.550
	Educational level	.001
Caregiving related characteristics	Total length of caregiving time (months)	.000
	Hours of caregiving per day	.000
	Cost of caring (10,000won)	.000
Persons with dementia characteristics	Age (years)	.012
	Educational level	.001
	R-MBPC	.000
Dependent Variables	SRAHP	.013
	ESES	.364
	ZBI-K	.458
	GDSSF-K	.002
	PSS	.367
	K-WHOQOL-BREF	.003
	SPPB	.001

Note. Exp.=Experimental group, Con.=Control group, R-MBPC=Revised – Memory and Behavior Problems Checklist, SRAHP=Self-Rated Abilities for Health Practices, ESES=Exercise Self-Efficacy Scale, ZBI-K=Korean version of Zarit Burden Interview, GDSSF-K=Geriatric Depression Scale: Short form – Korea version, PSS=Perceived Stress Scale, K-WHOQOL-BREF=Korean version of World Health Organization Quality of Life-BREF, SPPB=Short Physical Performance Battery

2) Homogeneity test of general characteristics

General Characteristics of the participants are shown in Table 8. The mean age of the participants in each group was 74.23(SD=7.60) in the experimental group and 75.83(SD=6.10) in the control group. The majority were female in the experimental group (82.4%) and in the control group (76.7%). Experimental group educational level was evenly distributed between elementary to high school with a mean of 8.85(SD=4.21) years, control group education level was mostly in elementary school (30.0%) and high school (33.3%) with a mean of 9.43(SD=4.43) years. 85.3% of the experimental group were married and all of control group were married. Family type of participants were either elderly couple or living with their children, experimental group and control group were 64.7% and 73.3%, respectively. 73.3% of the experimental group and 93.3% of the control group had religion, this was the only significant difference between groups. More than half (58.8%) of the experimental group and half (50.0%) of the control group's monthly income was less than 990,000won. Most of the participants in both groups did not have a job, 76.5% and 83.3%, respectively. About half of the participants in both groups rated their perceived health status average, 47.1% and 56.7% in each group. Homogeneity test showed no significant differences between group except for religion.

Table 8. Homogeneity Test of General Characteristics

Characteristics		Exp.(n=34) n(%) or Mean±SD	Con.(n=30) n(%) or Mean±SD	χ^2 or t	p
Age(yrs)		74.23±7.60	75.83±6.10	-0.91	.362
	60~69	9(26.5)	5(16.7)	0.98	.612
	70~79	16(47.1)	15(50.0)		
	≥80	9(26.5)	10(33.3)		
Gender	Male	6(17.6)	7(23.3)	0.31	.573
	Female	28(82.4)	23(76.7)		
Educational level		8.85±4.21	9.43±4.43	-0.53	.593
	None	2(5.9)	1(3.3)	5.38*	.416
	Elementary school	9(26.5)	9(30.0)		
	Middle school	11(32.4)	5(16.7)		
	High school	7(20.6)	10(33.3)		
	University	3(8.8)	5(16.7)		
	Graduate school or above	2(5.9)	0		
Marital status	Married	29(85.3)	30(100)	4.78*	.244
	Divorced	2(5.9)	0		
	Separated	1(2.9)	0		
	Not married	2(5.9)	0		
Family type	Elderly couple	22(64.7)	22(73.3)	0.55	.457
	Living with children	12(35.3)	8(26.7)		
Religion	Yes	25(73.5)	28(93.3)	4.39	.036
	No	9(26.5)	2(6.7)		
Monthly income (10,000won)	Below 99	20(58.8)	15(50.0)	0.52*	.960
	100~199	8(23.5)	9(30.0)		
	200~299	3(8.8)	3(10.0)		
	300~399	1(2.9)	1(3.3)		
	Above 400	2(5.9)	2(6.7)		
Job status	No	26(76.5)	25(83.3)	0.46	.496
	Yes	8(23.5)	5(16.7)		
Perceived Health status	Very good	2(5.9)	0	3.86*	.600
	Good	8(23.5)	2(23.3)		
	Average	16(47.1)	17(56.7)		
	Bad	6(17.6)	6(20.0)		
	Very bad	2(5.9)	0		

Note. Exp.=Experimental group, Con.=Control group, *Fisher's exact test done

3) Care-related characteristics

As a result of analyzing the homogeneity test on the care-related characteristics, there was no significant difference between the two groups in all characteristics, confirming the homogeneity of two groups (Table 9).

Table 9. Homogeneity Test of Care-related Characteristics

Characteristics		Exp.(n=34) n(%) or Mean±SD	Con.(n=30) n(%) or Mean±SD	t or Z	p
Relationship with the patient	Spouse	26(76.5)	28(93.3)	3.22*	.266
	Daughter	5(14.7)	2(6.7)		
	Daughter-in-law	2(5.9)	0		
Months of caregiving		71.66±91.85	50.00±39.06	-0.93 ^b	.350
	0~30	6(17.6)	6(17.6)	2.31*	.333
	31~60	16(47.1)	16(47.1)		
	61~90	7(20.6)	7(20.6)		
	≥91	5(14.7)	5(14.7)		
Hours of care per day		16.96±6.62	17.86±7.06	-0.48 ^b	.627
	0~6	1(2.9)	3(10.0)	3.22*	.358
	7~12	10(29.4)	5(16.7)		
	13~18	9(26.5)	5(16.7)		
	19~24	13(41.2)	17(56.7)		
Ability of other caregivers	No	26(76.5)	25(83.3)	0.27*	1.00
	Yes	3(8.8)	1(3.3)		
	Sometimes	5(14.7)	4(13.3)		
Cost of caring (won)		46.97±27.21	57.30±55.70	-0.22 ^b	.822
	0~50	21(61.8)	20(66.7)	1.58*	.750
	51-100	12(35.3)	8(26.7)		
	101-150	0	1(3.3)		
	≥151	1(2.9)	1(3.3)		

Note. Exp.=Experimental group, Con.=Control group

*Fisher's exact test done, ^aIndependent t-test, ^bMann-Whitney U test

4) Characteristics of persons with dementia

As a result of analyzing the homogeneity test on the characteristics of PwD characteristics, there was no significant difference between the two groups in all characteristics, confirming the homogeneity of two groups (Table 10). R-MBPC was measured to confirm that the severity of BPSD in PwD was not significantly different which can affect family caregiver's physical and psychological health status of the family.

Table 10. Homogeneity Test of Persons with Dementia Characteristics

Characteristics		Exp.(n=34) n(%) or Mean±SD	Con.(n=30) n(%) or Mean±SD	χ^2 or t	p
Age (yrs)		80.00±7.15	80.16±6.44	-0.09	.923
	≤59	1(2.9)	0	0.86*	.781
	60~69	2(5.9)	1(3.3)		
	70~79	12(35.3)	12(40.0)		
	≥80	19(55.9)	17(56.7)		
Gender	Male	20(58.8)	21(70.0)	0.61	.435
	Female	14(41.2)	9(30.0)		
	None	3(8.8)	1(3.3)		
Educational level	Elementary school	13(38.2)	7(23.3)	3.00*	.710
	Middle school	6(17.6)	7(23.3)		
	High school	8(23.5)	10(33.3)		
	University	3(8.8)	4(13.3)		
	Graduate school or above	1(2.9)	1(3.3)		
	Mean±SD	7.87±4.91	9.93±4.06	-1.79	.077
Marital status	Married	25(73.5)	28(93.3)	3.63*	.085
	Separated	8(23.5)	2(6.7)		
Type of dementia	Alzheimer's	27(79.4)	26(86.7)	0.58*	.520
	Other	7(20.6)	4(13.3)		
R-MBPC		39.06±17.71	42.87±17.30	-0.53	.590

Note. Exp.=Experimental group, Con.=Control group, R-MBPC=Revised – Memory and Behavior Problems Checklist, *Fisher's exact test done

5) Homogeneity test of dependent variables

As a result of analyzing the homogeneity test on the dependent variables, there was no significant difference between the two groups, confirming the homogeneity of two groups (Table 11).

Table 11. Homogeneity Test of Dependent Variables

Dependent variable	Score range	Exp.(n=34) Mean±SD	Con.(n=30) Mean±SD	t or Z	p
Self-care self-efficacy	28-112	79.00±20.97	75.10±18.76	-1.27 ^b	.201
Exercise self-efficacy	0-1800	687.97±342.94	650.67±401.06	0.40 ^a	.690
Caregiving burden	0-12	46.53±17.78	44.47±20.71	0.42 ^a	.670
Depressive symptoms	0-88	8.74±3.71	8.30±4.38	-0.35 ^b	.720
Perceived stress	0-15	18.29±5.64	19.10±5.30	-0.58 ^a	.560
Health-related quality of life	0-40	80.24±13.04	80.47±16.90	-0.23 ^b	.814
Physical function	26-130	9.35±2.39	9.33±2.12	-0.36 ^b	.718

Note. Exp.=Experimental group, Con.=Control group, ^aIndependent t-test, ^bMann-Whitney U test

2. Hypothesis Testing

Main hypothesis 1-1. The experimental group participating in the PE-SER program will have a significantly higher self-care self-efficacy score than the control group.

As a result of analyzing the changes in scores of the self-care self-efficacy using the Self-Rated Abilities for Health Practices (SRAHP) after the completion of the program, experimental group had a significantly higher score than the control group ($p < .001$, Table 12). In the experimental group, the SRAHP score increased from 79.00 to 96.55, and the control group decreased from 75.10 to 69.87 (Figure 3). Thus, the first hypothesis was supported.

Table 12. Comparison of Self-Care Self-Efficacy between the Experimental and Control Group

Characteristics	Group	Pre-test Mean±SD	Post-test Mean±SD	Difference Mean±SD	Z	p
SRAHP	Exp. (n=34)	79.00±20.97	96.55±11.36	17.56±21.00	-4.167	<.001*
	Con. (n=30)	75.10±18.76	69.87±19.99	-5.23±21.01		

Note. Exp.=Experimental group, Con.=Control group, SD=Standard Deviation, SRAHP= Self-Rated Abilities for Health Practices
 * $p<.05$, Mann-Whitney U Test

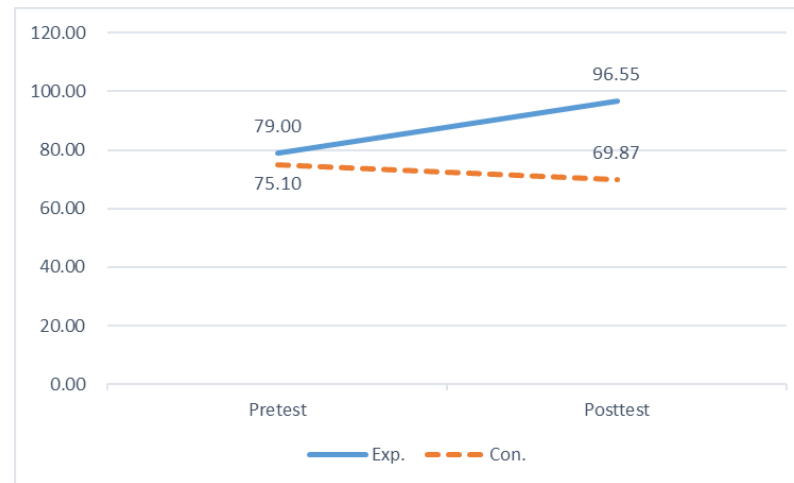


Figure 3. Changes in self-care self-efficacy

Main hypothesis 1-2. There The experimental group participating in the PE-SER program will have significantly higher exercise self-efficacy score than the control group.

As a result of analyzing the changes in scores of exercise self-efficacy using the Exercise Self-Efficacy Scale (ESES) after the completion of the program, experimental group had a significantly higher score than the control group ($p=.001$, Table 13). In the experimental group, the ESES score increased from 687.97 to 1010.29, and the control group decreased from 650.67 to 599.33 (Figure 4). Thus, the second hypothesis was supported.

Table 13. Comparison of Exercise Self-Efficacy between the Experimental and Control Group

Characteristics	Group	Pre-test Mean±SD	Post-test Mean±SD	Difference Mean±SD	t	p
ESES	Exp. (n=34)	687.97±342.94	1010.29±440.52	322.32±505.83	3.414	.001*
	Con. (n=30)	650.67±401.06	599.33±387.67	-51.33±341.98		

Note. Exp.=Experimental group, Con.=Control group, SD=Standard Deviation, ESES=Exercise Self-Efficacy Scale

* $p < .05$, Independent t-test



Figure 4. Changes in exercise self-efficacy

Sub-hypothesis 1. There The experimental group participating in the PE-SER program will have significantly higher physical function level than the control group.

As a result of analyzing the changes in physical function level using the Short Physical Performance Battery (SPPB) after the completion of the program, experimental group had a significantly higher level than the control group ($p<.001$, Table 14). In the experimental group, the SPPB score increased from 9.35 to 11.62, and the control group decreased from 9.33 to 7.67 (Figure 5). Thus, the third hypothesis was supported.

Table 14. Comparison of Physical Function between the Experimental and Control Group

Characteristics	Group	Pre-test	Post-test	Difference	Z	p
		Mean±SD	Mean±SD	Mean±SD		
SPPB	Exp. (n=34)	9.35±2.39	11.62±0.77	2.26±2.31	-3.741	<.001*
	Con. (n=30)	9.33±2.12	7.67±2.86	-1.67±2.45		

Note. Exp.=Experimental group, Con.=Control group, SD=Standard deviation, SPPB= Short Physical Performance Battery

* $p<.05$, Mann-Whitney U Test



Figure 5. Changes in physical function

Sub-hypothesis 2. The experimental group participating in the PE-SER program will have significantly lower level of caregiving burden than the control group.

As a result of analyzing the changes in scores of caregiving burden using the Korean version of Zarit Burden Interview (ZBI-K) after the completion of the program, experimental group had a significantly lower score than the control group ($p < .001$, Table 15). In the experimental group, the ZBI-K score decreased from 46.53 to 39.24, and the control group increased from 44.47 to 50.33 (Figure 6). Thus, the fourth hypothesis was supported.

Table 15. Comparison of Caregiving Burden between the Experimental and Control Group

Characteristics	Group	Pre-test	Post-test	Difference	t	p
		Mean±SD	Mean±SD	Mean±SD		
ZBI-K	Exp. (n=34)	46.53±17.78	39.24±17.19	-7.29±13.11	-3.965	<.001*
	Con. (n=30)	44.47±20.71	50.33±18.24	5.87±13.40		

Note. Exp.=Experimental group, Con.=Control group, SD=Standard Deviation, ZBI-K= Korean version of Zarit Burden Interview
 * $p<.05$, Independent t-test



Figure 6. Changes in caregiving burden

Sub-hypothesis 3. The experimental group participating in the PE-SER program will have significantly lower level of depressive symptoms than the control group.

As a result of analyzing the changes in scores of depressive symptoms using the Geriatric Depression Scale: Short form – Korea version (GDSSF-K) after the completion of the program, experimental group had a significantly lower score than the control group ($p < .001$, Table 16). In the experimental group, the GDSSF-K score decreased from 8.74 to 6.09, and the control group increased from 8.30 to 9.90 (Figure 7). Thus, the fifth hypothesis was supported.

Table 16. Comparison of Depressive Symptoms between the Experimental and Control Group

Characteristics	Group	Pre-test	Post-test	Difference	Z	p
		Mean±SD	Mean±SD	Mean±SD		
GDSSF-K	Exp. (n=34)	8.74±3.71	6.09±4.18	-2.65±4.36	-3.722	<.001*
	Con. (n=30)	8.30±4.38	9.90±3.81	1.60±2.86		

Note. Exp.=Experimental group, Con.=Control group, SD=Standard Deviation, GDSSF-K= Geriatric Depression Scale: Short form – Korea version

* $p < .05$, Mann-Whitney U Test



Figure 7. Changes in depressive symptoms

Sub-hypothesis 4. The experimental group participating in the PE-SER program will have significantly lower level of perceived stress than the control group.

As a result of analyzing the changes in scores of perceived stress using the Perceived Stress Scale (PSS) after the completion of the program, experimental group did not show a significantly lower score than the control group ($p=.779$, Table 17). In the experimental group, the PSS score decreased from 18.29 to 15.79, and the control group was slightly decreased from 19.10 to 18.77 (Figure 8). Thus, the sixth hypothesis was rejected.

Table 17. Comparison of Perceived Stress between the Experimental and Control Group

Characteristics	Group	Pre-test Mean±SD	Post-test Mean±SD	Difference Mean±SD	t	p
PSS	Exp. (n=34)	18.29±5.64	15.79±6.08	-2.50±7.72	-1.277	.206
	Con. (n=30)	19.10±5.30	18.77±6.15	-0.33±5.49		

Note. Exp.=Experimental group, Con.=Control group, SD=Standard Deviation, PSS=Perceived Stress Scale

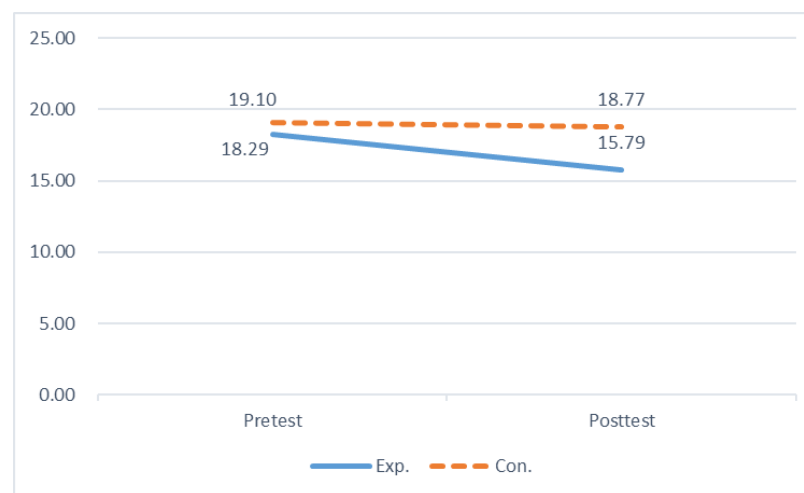


Figure 8. Changes in perceived stress

Sub-hypothesis 5. The experimental group participating in the PE-SER program will have significantly higher level of health-related quality of life than the control group.

As a result of analyzing the changes in scores of health-related quality of life using the Korean version of World Health Organization Quality of Life-BREF (K-WHOQOL-BREF) after the completion of the program, experimental group had a significantly higher score than the control group ($p=.011$, Table 18). In the experimental group, the K-WHOQOL-BREF score decreased from 80.24 to 89.09, and the control group increased from 80.47 to 79.83 (Figure 9). Thus, the seventh hypothesis was supported.

Table 18. Comparison of Health-related Quality of Life between the Experimental and Control Group

Characteristics	Group	Pre-test	Post-test	Difference	Z	p
		Mean±SD	Mean±SD	Mean±SD		
K-WHOQOL-BREF	Exp. (n=34)	80.24±13.04	89.09±13.37	8.85±13.38	-2.545	.011*
	Con. (n=30)	80.47±16.90	79.83±16.58	-0.63±12.21		

Note. Exp.=Experimental group, Con.=Control group, SD=Standard Deviation, K-WHOQOL-BREF= Korean version of World Health Organization Quality of Life - BREF

* $p < .05$, Mann-Whitney U Test

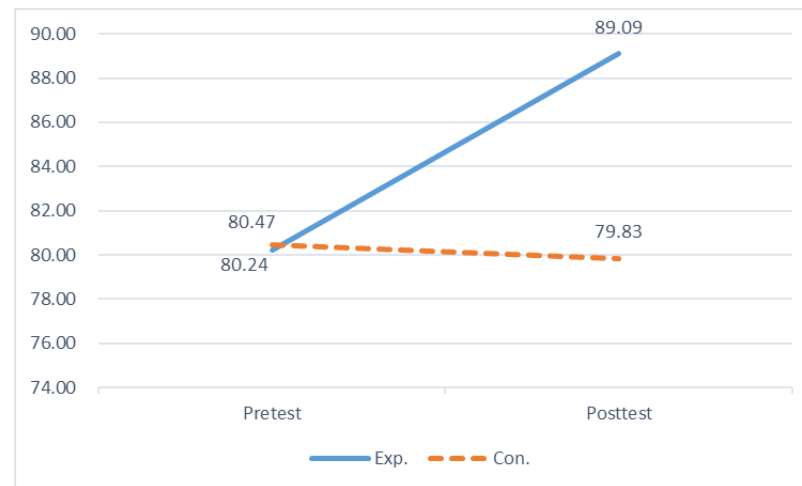


Figure 9. Changes in health-related quality of life

VI. Discussion

The purpose of this study is to develop and implement the PE-SER program based on Bandura's self-efficacy theory (1977) to family caregivers of PwD living in the community, and to examine its effects on self-care self-efficacy, exercise self-efficacy, physical function, caregiving burden, depressive symptoms, perceived stress and health-related quality of life. This chapter discusses the composition, process, and effects of the PE-SER program around the results of the hypothesis testing.

1. Implementation of the PE-SER program for Family Caregivers of PwD

The PE-SER program was introduced to the family caregivers of PwD as "Superman exercise." It was named "Superman exercise" because family caregivers take care of the PwD and also have to take care of themselves, just like a Superman who can help other people and able to do everything and anything. The image of Superman in the PowerPoint slides and physical exercise diary was a person who is healthy with bulky muscles.

In the beginning of the program and in between sections throughout the program, posing like the Superman was carried out. Superman pose is also called the power pose which is a position that one stands very tall and upright with feet hip-width apart, chest puffed out and planting their hands on their

hips. It has been proven to increase the sense of power, self-confidence, tolerance for risk, increase in testosterone level, and decrease in cortisol level (Carney, Cuddy, & Yap, 2010; Golec de Zavala, Lantos, & Bowden, 2017). This Superman pose was recommended to the family caregivers in their daily life.

The PE-SER program was delivered via four different delivery methods: group intervention, individual intervention, telephone counseling and physical exercise diary.

Group intervention was conducted in a group of eleven or twelve family caregivers. After a short recreation time in the beginning, the physical exercise program started off with a warm-up using the national gymnastics (“kook-min chae-jo”) which all the movements are familiar to the participants. Participants commented that national gymnastics reminded them when they were back in school as a little kid, and that it was fun to do. After the warm-up, the main exercise was conducted with movements of stretching, balancing, cardiovascular and muscle-strengthening. Most of the family caregivers were familiar with the importance of aerobic exercise, such as walking, but many did not recognize the importance of muscle-strengthening exercise. In a previous study, it was reported that older adults had a wrong information that muscle strength training can only be done at a facility (Harada, Shibata, Lee, Oka, & Nakamura, 2014). So, during the main exercise and in the education session, the importance of muscle strength training was emphasized, such as

decline in muscle mass is associated with negative health consequences such as sarcopenia, osteoporosis, falls, obesity and diabetes (Denison, Cooper, Sayer, & Robinson, 2015). And it was taught that muscle strengthening exercise can be done easily at home without any equipment.

The participants shared that they feel like their thigh had more muscle since they have started to exercise, and it was easier for them to climb up the stairs when sharing their experience and feelings about exercising. And some shared that their back pain decreased after performing the muscle-strengthening exercise movements. Vicarious experience by sharing their thoughts and feelings with other peers and presenting their exercise goals may have stimulated their interest in exercising and their motivation to start performing physical exercise.

Individual intervention was provided in person and via telephone counseling. In-person individual intervention was arranged before and after the group exercise. Telephone counseling was administered between the weekly group exercise sessions. Through weekly telephone counseling, researcher was able to recognize the health problems of participants that effected their daily physical exercise performance. This is also thought that it influenced the family caregivers to continue participate in the PE-SER program by making them feel like they are receiving special attention and support. Previous study pointed out that monitoring and providing feedback to the participants to perform physical exercise regularly is important (Room,

Hannink, Dawes, & Barker, 2017). Through telephone counseling, the effectiveness of self-monitoring was repeatedly emphasized, and if there were any difficulties in recording the physical exercise diary, they could contact the researcher at any time.

Recording the physical exercise diary had two parts; setting the goal for the week and keeping track of how much they exercised for the day. However, family caregivers who are older and have low education level may have difficulty recording the physical exercise dairy daily and it can be a burden due to their decline in sensory functions such as vision and hearing and decreased ability of problem solving (Lee, Lim, & Kim, 2007). It was also a challenge in this study for the family caregivers to record their physical exercise dairy daily, so the researcher had to dedicate more time and attention to monitor if the participants were utilizing the physical exercise diary correctly and consistently. In this study, the researcher was not able to obtain the information of the family caregiver's physical exercise intensity and frequency. In future studies, more detailed information should be obtained, and the study may be designed as a tailored intervention.

In a previous study that performed home-based exercise counseling for at least 120 minutes per week for 12 months of home-based exercise counseling, perceived stress, caregiving burden and depression of sedentary women caring for relatives was decreased, and the motivational readiness and knowledge of the benefits of physical exercise was increased (Castro et al.,

2002). Comparing the length of the intervention done in previous studies, it is worth considering that the results of this study are similar despite the shorter duration of PE-SER program in this study. Shorter length of intervention like PE-SER program can be more easily applicable to the family caregivers due to their situation.

The PE-SER program was planned for 60 minutes per session for eight weeks for the following reasons. Family caregivers usually have to stay with the PwD most of their time, so there is very limited free time for themselves; they were only given free time during the PwDs' cognitive program at the dementia care center, which was 60 minutes, once a week. And using the dementia care center program room as a research space also had to be taken into consideration. Although the intervention session was shorter than the previous studies (Connell & Janevic, 2009; Farran et al., 2016), physical and psychological improvement is thought to shown due to the utilization of the self-efficacy resources in the PE-SER program.

In a previous study, PwD were asked to wait outside while the family caregivers were participating in the study. It increased the family caregiver's level of concern so the participants could not concentrate during the intervention, so with the help from the dementia care center, PwD were included in the program, which made it possible to conduct the intervention smoothly (Kim, 2014). In contrast, the PE-SER program took advantage of the time the family caregivers had to wait while the PwD is in cognitive

training.

2. Evaluation of the PE-SER program for Family Caregivers of PwD

This study examined the effects on self-care self-efficacy, exercise self-efficacy, physical function, caregiving burden, depressive symptoms, perceived stress and health-related quality of life using the nonequivalent control group pretest-posttest design to develop the PE-SER program and evaluate its effectiveness.

As a result of the hypothesis test, self-care self-efficacy (SRAHP score) of the family caregivers of PwD who participated in the eight weeks PE-SER program was significantly higher than those who did not participate in the program. A study done over four years proved that increase in physical exercise is associated with the increase in self-efficacy (Elavsky et al., 2005). However, unlike the results from this study, previous study done with telephone-based exercise intervention for wives of PwD showed no significant difference in self-care self-efficacy (Connell & Janevic, 2009). In this study, self-care self-efficacy was measured using 1-item on a 5-point scale, “How confident do you feel in being able to take care of yourself?” (Gallant & Connell, 1998). This single-item instrument may have not accurately measured this construct. At baseline, the scores for this measure

were high (mean=4.1, SD=9.00), that could have created a ceiling effect and made it difficult to measure the change over time. And the participants in the study included wives who were already engaging in physical exercise which was an exclusion criterion in this study. This could indicate that participants were already practicing self-care by exercising, so the self-care self-efficacy might have not shown a significant difference. The self-care self-efficacy may not have shown a significant increase also due to the intervention delivery method which was telephone based. Since the caregivers of the PwD are at high risk of social isolation (Kovaleva, Spangler, Clevenger, & Hepburn, 2018) intervention delivered in-person as a group in the PE-SER program may have effected positively.

Along the self-care self-efficacy score, the exercise self-efficacy (ESES score) also showed a statistically significant difference, experimental group had a significantly higher score than the control group. In the present study it showed the same result from a study that analyzed the effects of physical exercise program using telephone counseling on spouses of PwD living in the community that reported statistically significant difference in exercise self-efficacy scores between the experimental group and the control group (Connell & Janevic, 2009).

This finding suggests that the PE-SER program contents increased the participants' confidence that they could exercise by overcoming the barriers such as feeling tired or not having enough time. Self-efficacy for exercise is

such a strong determinant of the initiation and performance of physical activity and exercise (Sherwood & Jeffery, 2000). The ability to increase one's self-efficacy is considered to be an important goal in some researchers (Sallis & Owen, 1998), since it is correlated with beneficial effects in psychological and physical health outcomes (Atkins, 2010; King et al., 2006).

Improvement in self-efficacy has been shown in relatively brief, acute sessions of physical exercise (McAuley, Courneya, & Lettunich, 1991; McAuley et al., 1993). Initiating the behavior of physical exercise is most critical. When a person begins to exercise, receiving feedback regarding their physical exercise performance may enable them to sustain and increase their exercise self-efficacy (Sherwood & Jeffery, 2000). Self-monitoring can also be used by those who perform exercise by themselves to monitor their performance and keep track of their physical exercise achievements (McAuley et al., 1993; Williams & Lord, 1995).

Comparing the physical function (SPPB score) of the participants after eight weeks of intervention, experimental group had a significantly higher score than the control group in physical function scores. This is the same result as the previous physical activity intervention to improve lifestyle and independence for sedentary older adults where their SPPB scores improved at 6 months and 12months compared to the baseline score (Marco et al., 2006).

There are studies showing that low SPPB scores indicate increased rate of disability, hospitalization, admission rate of long-term care facilities (Gitlin,

2013), and mortality (Schulz & Beach, 1999). The improvement of SPPB scores in the experimental group in this study is meaningful for families with PwD; it indicates that it could lower negative health outcomes. In a cohort study conducted in Korea, older adults aged 85 years or older reported a significant decrease (approximately 40%) in muscle strength compared to the younger older adults (Kim et al., 2010). As a strategy for slowing down further muscle loss and weakness due to aging, family caregivers of PwD should be guided to regularly perform physical exercise to increase their independence and quality of life.

Post-test showed that the experimental group had significantly lower score than the control group in the caregiving burden (ZBI-K score). Caregiving burden was also significantly decreased in a 12-month home-based exercise counseling intervention study for women relative caregivers for PwD which showed that caregiving burden was decreased significantly (Castro et al., 2002).

The reason for the decrease in caregiving burden after PE-SER program can be considered as follows. First, increased physical function and strength after the physical exercise program may have reduced caregiving burden (Pucciarelli et al., 2017). Considering that the health condition of PwD will deteriorated due to their disease in the future, the health condition of caregivers may also continue to deteriorate. When developing a program to reduce the caregiving burden for caregivers of PwD, positive factors

improving physical function should be included into the program beyond counseling and education.

Second, caregiving burden may have been reduced due to the emotional support generated during participation in the PE-SER program (Chang, Chiou, & Chen, 2010). In this study, main component of the PE-SER program was provided as a group intervention. And the interaction with other family caregivers before and after the PE-SER program and the telephone counseling may have provided emotional support among participants and may worked as a major factor in reducing caregiving burden. And the informational support provided during the education section may had a positive effect on the caregiving burden.

In dementia care centers and day care services, PwD has always been the main care recipient and all the services and attention has been focused on the PwD and not to the family caregivers. However, during the PE-SER program the family caregivers said that they felt well treated because the intervention was focused on the well-being of the family caregivers and the program was constructed so that the PwD could not participate in the PE-SER program. Since the occupational therapists and the nurses at the dementia care center were taking care of the PwD, the family caregivers could be separated away from the PwD and participated in the program without the burden of worrying about them.

In addition, the PE-SER program was a place for the family members who

take care of the PwD to meet periodically and interact and share information about their caregiving skills and burden. For example, before the program began, a family caregiver would talk about the PwD's behavior problem and changes, then other family caregivers would listen and give advice or tell them how they would or have reacted in the past. After a few weeks, some family caregivers even went out for lunch together after the program.

This could have affected the effectiveness of the PE-SER which is a limitation. The effect of the PE-SER program may be caused by factors other than exercising, such as social support from interacting with other participants. However, in reality, these situation and characteristics are actually important when programs are conducted at most dementia care centers.

Experimental group had a significantly lower score than the control group in the depressive symptoms (GDSSF-K score). This is the same result from a 12month home-based exercise counseling intervention study done with women caring for relatives with dementia (Castro et al., 2002).

Previous studies showed that more than half of the main caregiver suffers from chronic depression, which is 2 to 3 times higher risk of depression than the general population (Gusi et al., 2009; Pinquart & Sörensen, 2007). Physical exercise programs have shown to alleviate depression (Moore & Blumenthal, 1998). Depression among caregivers has been suggested to be related to poorer physical health (Pruchno, Kleban, Michaels, & Dempsey, 1990). Therefore, performing physical exercise is important and it appears to

also have strong psychological benefits such as reducing depression and caregiving burden regardless of the program contents or the type of physical exercise (Chekroud et al., 2018; Felipe Barreto Schuch & Stubbs, 2019).

Daily caring hours has been shown to be positively correlated with the depression level of caregivers of PwD (Schulz et al., 2008; Wong et al., 2008). This PE-SER program was carried out by initiating the program only with the family caregivers by utilizing the time when the dementia care center was providing cognitive treatment to the PwD. Family caregivers provided feedback saying, "It's a break just by being away from the patient.", "It's such a relief that we get to exercise without worrying about the patient." Having their own time to take care of their own health may have reduced their depression level.

Family caregivers in the control group depression score increased compared to their pre-test score. Family caregivers who did not want to participate in the PE-SER program were allocated to the control group. This could be a bias of the study because their level of motivation to perform physical exercise is different. As the PE-SER program progressed, some asked the family caregivers who are in the PE-SER program, staff at the dementia care center and the researcher if they could join the group because they were told and they could see the family caregivers were very satisfied with the program. Unfortunately, they were told that they could not and not being able to participate in the program may have made them feel left out and

abandoned, even though it was explained that they could participate in the program after the study was completed. This may have influenced their mood which is a limitation of this study, double blinded randomized controlled trial is suggested in the future.

However, the experimental group did not show a significantly lower score in the perceived stress level (PSS score) than the control group. Previous study showed different result that participants who engaged in higher levels of physical exercise reported lower levels of perceived stress. Physical exercise has positive effect on mood and stress level (Gauvin, Rejeski, & Norris, 1996; Reed, Berg, Latin, & La, 1998; Steptoe, Kimbell, & Basford, 1998; Yeung, 1996). Telephone-based exercise intervention for female spouse caregivers of PwD also showed that perceived stress level was significantly decreased immediately after the intervention (Connell & Janevic, 2009). Literature has been proven that poor health behavior such as lower levels of physical exercise is associated with high levels of stress (Allison, Adlaf, Ialomiteanu, & Rehm, 1999).

Despite all the results from the previous study, family caregivers who participated in the PE-SER program did not show a significant decrease in perceived stress level. This may be due to the chronic stress that the family caregivers are experiencing (Schulz & Beach, 1999; Schulz & Martire, 2004). There is overwhelming evidence in previous literature on caregiving that providing care for a relative diagnosed with dementia is stressful (Schulz &

Martire, 2004). The progressive impairment in cognition, daily function and various BPSD are among the most significant stressors (Zhang, Vitaliano, & Lin, 2006). Responsibility and the role of the caregiver of PwD also plays a role as source of their source of chronic stress (Kovaleva et al., 2018). Since the source of the stress has not been removed, perceived stress may have not decreased significantly.

Lastly, experimental group had a significantly higher score than the control group in the quality of life (K-WHOQOL-BREF) score. This is the same result from a 36 week cross-over trial to compare the effectiveness of an integrative group exercise program called “Preventing loss of independence through exercise” which was conducted in a dyad of the PwD and caregiver (Barnes et al., 2015).

Physical exercise has been proven to positively influence quality of life in older adults (McAuley et al., 2006). And it has been consistently identified as a key component of healthy aging (Otero-Rodríguez et al., 2010). Higher levels of quality of life has been linked to reduce the risk of chronic illness and mortality (Koivumaa-Honkanen et al., 2000; Strine, Chapman, Balluz, Moriarty, & Mokdad, 2008), along with the improvement of mental and physical health (McAuley et al., 2006).

Caring for PwD and those with similar cognitive impairments presents unique stressors and burden for the caregiver (Garand, Amanda Dew, Eazor, DeKosky, & Reynolds III, 2005). They are shown to be at risk for impaired

quality-of-life. A study that compared the quality of life between a group of women who is a relative and provided care of a PwD with an age-matched group of non-caregiver women showed that caregivers of PwDs' health-related quality of life was about 22% lower than the non-caregivers (Gusi et al., 2009).

Many interventions for family caregivers of PwD was conducted via telephone or through the media. And many studies were not able to conduct the intervention as a group. However, the PE-SER program in this study was delivered in-person as a group and individually. One of the strengths of the PE-SER program is that the main part of the intervention was administered as a group. Exercising with other family caregivers may have motivated them as a group. Intervention delivery method may have caused more effectiveness and sensitive to the measurements.

The usual program provided at the dementia care center for family caregivers such as art therapy, music therapy and gardening require lots of requirements to conduct the program. However, the physical exercise program such as PE-SER program has an advantage because all it requires is a steady chair and one or two instructor and staff. So, physical exercise program is expected to be utilized practically in clinical sites.

The PE-SER program was designed to overcome all the barriers that older adults face when performing physical exercise, such as weather, place, time, and supplies. So, the family caregivers could continue to exercise whenever

and wherever they want to. Considering the fact that family caregivers of PwD provide care for a long time and that older adults have lower economic status, it is important that they do not need to consider about space, time and expenses when performing physical exercise.

The physical exercise diary, videos and educational materials that was produced during this study was given to the dementia care center. The PE-SER program should be continuously provided for family caregivers of PwD who use dementia care center. Since there are only a few numbers of physical exercise program that can continuously motivate family caregivers of PwD to exercise by increasing self-efficacy, it is expected that the PE-SER program to be a useful resource.

For family caregivers of PwD living in the community who are not able to use the service provided at the dementia care center, a program employing technology such as text message or smartphone application should be developed. The development and effectiveness of the program should be tested in future research.

Significant changes in self-care self-efficacy, exercise self-efficacy, physical function, caregiving burden, depressive symptoms and health-related quality of life were shown compared to the other physical exercise studies done with family caregivers of PwD for 12 months and longer. Providing such physical exercise program proved to be an effective way to maintain and promote the health of family caregivers of PwD.

3. Nursing Implications

Based on the results of this study, nursing significances in terms of nursing theory, nursing research and nursing practice are as follows.

1) Aspect of nursing theory

Bandura's self-efficacy theory (1977) suggests a strategy for changing human behavior in a positive direction and it is applicable to several different groups who need to change their health behavior. This study is meaningful that it provided an opportunity to empirically understand the self-efficacy theory and its concept and laid the foundation for nurses to provide evidence-based practice for family caregivers of PwD living in the community through PE-SER. Nurses' interventions based on scientific knowledge can contribute to improving the quality of care and well-being of family caregivers of PwD living in the community.

2) Aspect of nursing research

Most of the existing studies conducted on family caregivers of PwD in Korea are mainly composed of psychological education and there is limited number of research done with physical exercise program to take care of their physical health. Some research is done in other countries; however, these physical exercise programs are conducted with the patient as a dyad or via

telephone or video clips. However, in this study, the eight-week PE-SER program was developed to reflect the limitations of the existing research using the four self-efficacy resources with group physical exercise, individual/telephone counseling, and physical exercise diary. It demonstrated the effectiveness of psychosocial effect and physical function improvement. In addition, it confirmed the effectiveness of the PE-SER program that applied self-efficacy theory to improve the physical and psychological health of family caregivers of PwD. This may help to suggest strategies for improving the health-related quality of life for families with dementia and other caregivers of chronically ill patients who need to take care of themselves.

This study is also meaningful in that it informs the clinical significance of family caregivers of PwD living in the community and developing an effective program that targets the family caregivers of PwD.

3) Aspect of nursing practice

The results of this study confirmed the applicability of the PE-SER program in dementia care center, and the evidence that the health of family caregivers of PwD living in the community can be maintained and promoted through appropriate interventions.

It is expected that the PE-SER program to be operated at the dementia care center not as a post-care concept but as a preventive point of view. Continuing the PE-SER program will not only contribute to maintain and

improve the health of caregivers of PwD but also develop community nursing practices.

4. Limitations

There are several limitations of this study that should be noted.

First, even though this study was conducted at multicenter, it targets a small number of family caregivers of PwD who is registered at the dementia care centers in Gyeonggi-do and Incheon. And this study recruited the participants on a voluntary basis, so the PE-SER program participant is unlikely to be a representative of the whole population of the family caregivers of PwD.

Second, there is a limitation related to the measurement of physical exercise performance. Self-recording of the physical exercise log in the physical exercise diary for a lifestyle change is meaningful for checking the goals and achievements of individuals. It has been used successfully in previous study with older adults (Hancox et al., 2019; Nicolson, Hinman, Wrigley, Stratford, & Bennell, 2019). However, the accuracy of the exercise performance is lower compared to using pedometers or actigraphy (Puterman et al., 2018). Also, the physical exercise diary was not properly utilized for all participants in this study for family caregivers who felt writing difficult and burdened. More attention and assistance may be required when the intervention requires daily logs or more sensitive measure should be utilized

for further research.

Third, this study only compared and analyzed the results of pre-test and post-test immediately after the end of PE-SER program and reported the effect of the program. To see if the program effectiveness continues it should be checked through repeated measures after a long period of six months or a year.

Fourth, during the telephone counseling, the conversation with the family caregiver and the researcher was not recorded or dictated to be a reliable source of data. In further studies, recording of the counseling is recommended.

Fifth, the PE-SER program effectiveness may have been contributed by the group effect. Conducting the intervention as a group may have motivated the family caregivers to actively participate in the study. This needs to be taken into consideration when interpreting the results of this study.

Lastly, this study was a nonequivalent control group pre-test & post-test design and was not able to conduct a randomized controlled trial. Due to strong opposition that was encountered when family caregivers of PwD were informed in advance that they could possibly not be able to participate in the program in a random manner. So, only family caregivers who are ready and willing to participate were included in the study, thus our study results may only be applicable to individuals who are motivated. Future studies should be conducted as a randomized controlled trial to include family caregivers who are less motivated and yet ready to perform physical exercise.

VII. Conclusion

The purpose of this study was to develop and provide a physical exercise program using the self-efficacy resources for family caregivers of PwD living in the community and to assess the effectiveness by measuring self-efficacy, exercise self-efficacy, physical function, caregiving burden, depression, and health-related quality of life. The PE-SER program aimed to maximize the effect of continuously exercising to increase physical exercise for the improvement of physical and psychological health.

In order to evaluate the effect of the PE-SER program, nonequivalent control group pretest-posttest design was conducted. PE-SER program was provided once a week for eight weeks, 34 family caregivers in the experimental group and 30 in the control group. Control group PE-SER program was conducted after the experimental group was done.

After eight weeks of intervention, Self-Rated Abilities for Health Practices (SRAHP), Exercise Self-Efficacy Scale (ESES) score, Short Physical Performance Battery (SPPB) score, Korean version of Zarit Burden Interview (K-ZBI) score, Geriatric Depression Scale: Short form–Korea version (GDSSF-K) score and Korean version of World Health Organization Quality of Life–BREF (K-WHOQOL-BREF) score was significantly different, and there was no significant difference in Perceived Stress Scale (PSS) score.

In conclusion, results from this study suggest that PE-SER program for older adults caring for family members with dementia may be effective at increasing self-care self-efficacy, exercise self-efficacy, physical function, quality of life and may also reduce caregiving burden, depressive symptoms. Such results will promote hope and encourage decision makers to implement innovative approaches for wider community-based intervention to improve physical exercise for older adults at high risk.

Based on the results of this study, following are the suggestions.

First, this study was conducted at only three dementia care centers in Gyeonggi-do and Incheon. It is suggested that dementia care centers in rural areas need to verify and compare the effect repeatedly.

Second, this study verified the program effectiveness only through eight weeks of pre and post measurement. It is suggested that a long-term follow-up study of 6 months or 1 year to be conducted.

Third, we suggest a randomized controlled trial using the double-blind method to verify the effect of PE-SER program.

Fourth, we suggest a study to verify the effectiveness of applying PE-SER to caregivers of other chronic diseases other than the family caregivers of PwD.

Fifth, it is suggested that a study evaluating the effectiveness of PE-SER programs through monitoring family caregivers' self-care and physical exercise performance using technology such as text message and applications.

Appendixes

Appendix 1. Approval of Institutional Review Board

심의결과 통보서			
수신			
연구책임자	이름* 김지연	소속* 간호대학	직위* 박사과정
지원기관	해당없음		
과제정보			
승인번호	IRB No. 1910/001-012		
연구과제명	제가 치매환자가족 노인부양자를 위한 문동프로그램 개발 및 효과평가		
연구종류	학위 논문 연구 심문조사		
심의종류	신규		
심의일자	2019-10-14		
심의대상	설명문 및 동의서 또는 서면동의 면제사유서 모집문건 (재심의 답변서)		
심의결과	승인		
승인일자	2019-10-14	승인유효기간	2020-10-13
평가보고주기	12개월		
심의의견	1. 심의결과 제출하신 연구계획에 대해 승인합니다. 2. 연구자께서는 승인된 문서를 사용하여 연구를 진행하시기 바라며, 만일 연구진행 과정에서 계획상에 변경사항 (연구자 변경, 연구내용 변경 등) 이 발생될 경우 본 위원회에 변경신청을 하여 승인 받은 후 연구를 진행하여 주십시오. 3. 유효기간 내 연구가 끝났을 경우 종료 보고서를 제출하여야 하며, 승인유효기간 이후에도 연구를 계속하고자 할 경우, 2020-09-13까지 지속성을 반드시 보고하여 주십시오.		
검토의견	기획서 검토 의견		
	동의서 검토 의견		
	기타 검토의견		
<p>본 위원회가 승인한 연구를 수행하는 연구자들은 다음의 사항을 준수해야 합니다.</p> <ol style="list-style-type: none"> 1. 반드시 계획서에 따라 연구를 수행해야 합니다. 2. 위원회의 승인을 받은 연구참여자에게 동의서를 사용해야 합니다. 3. 모국어가 한국어가 아닌 연구참여자에게는 승인된 동의서를 연구참여자의 모국어로 번역하여 사용해야 하며 번역본은 인증 및 위원회의 승인을 거쳐야 합니다. 4. 연구참여자에 보상을 위해 불가피한 경우를 제외하고는 연구 진행중의 변경에 대해서는 위원회의 사전 승인을 받아야 합니다. 연구참여자의 보호를 위해 취해진 응급상황에서의 변경에 대해서는 즉각 위원회에 보고해야 합니다. 5. 위원회에서 승인 받은 계획서에 따라 등록된 연구참여자의 사망, 입원, 심각한 질병에 대해서는 위원회에 서면으로 보고해야 합니다. 6. 임상시험 또는 연구참여자의 안전에 대해 유해한 영향을 미칠 수 있는 새로운 정보는 즉각 위원회에 보고해야 합니다. 7. 위원회의 요구가 있을 때에는 연구의 진행과 관련된 사항에 관하여 위원회에 보고해야 합니다. 8. 연구참여자가 모집광고는 사후 전에 위원회로부터 승인을 받아야 합니다. 9. 강제 혹은 부당한 영향력이 없는 상태에서 충분한 설명에 근거하여 연구참여자로부터 동의를 받아야 하며, 잠재적인 연구참여자에 대해서 연구 참여 여부를 숙려할 수 있도록 충분한 기회를 제공해야 합니다. 			

2019년 10월 14일

서울대학교 생명윤리위원회 위원장



Appendix 2. Participant Informed Consent Form (Control group)

IRB No. 1910/001-012

유효기간: 2020년 10월 13일

연구참여자용 설명서 및 동의서 - 대조군

연구 과제명: 제가 치매환자가족 노인부양자를 위한 운동프로그램 개발 및 효과평가

연구 책임자명: 김지연 (서울대학교 간호대학 박사과정생)

이 연구는 치매안심센터를 이용하는 치매환자가족 부양자를 위한 통합적 운동프로그램을 개발하고 그 효과를 평가하고자 시행되는 연구입니다. 본 연구는 치매안심센터를 등록하고 이용하는 치매환자가족중 60세 이상 노인 66여 명을 대상으로 하는 중재연구이기 때문에 귀하는 이 연구에 참여하도록 권유받았습니다. 이 연구를 수행하는 서울대학교 소속의 김지연 연구원(7.

이 귀하에게 이 연구에 대해 설명해 줄 것입니다. 이 연구는 자발적으로 참여 의사를 밝히신 분에 한하여 수행 될 것이며, 귀하께서는 참여 의사를 결정하기 전에 본 연구가 왜 수행되는지 그리고 연구의 내용이 무엇과 관련 있는지 이해하는 것이 중요합니다. 다음 내용을 신중히 읽어보신 후 참여 의사를 밝혀 주시길 바라며, 필요하다면 가족이나 친구들과 의논해 보십시오. 만일 어떠한 질문이 있다면 담당 연구원이 자세하게 설명해 줄 것입니다.

1. 이 연구는 왜 실시합니까?

치매환자와 그들을 돌보는 치매환자 가족들이 급증하고 있는 치매안심센터를 중심으로 지역사회 거주하는 치매노인 가족부양자가 본인의 건강관리를 유지하도록 지속적인 운동의 필요성과 운동방법을 보호자들에게 직접 교육하는 프로그램 개발 및 보급이 절실히 요구되고 있으므로 치매안심센터를 등록하고 이용하는 치매환자의 가족들을 위한 통합적 운동프로그램을 개발하고 그 효과를 평가하고자 합니다.

2. 얼마나 많은 사람이 참여합니까?

본 연구의 선정기준에 의해 선정된 치매환자 가족 66여명이 참여할 것입니다. 이 중 33명은 대조군으로 배정되고, 나머지 33명은 실험군으로 배정될 것입니다. 8주 프로그램을 모두 참석할 수 있는지 여부를 물어보고, 프로그램 8주 모두 참석할 수 있는 연구참여자는 실험군으로 배정하고, 8주 모두 참석하지 못하는 연구참여자들은 대조군으로 배정할 것입니다.

Version 1.1(2019.10.14.)

연구책임자: 김지연
연구비서: 김지연

3. 단일 연구에 참여하면 어떤 과정이 진행되니까?

설문작성은 프로그램 참여 전후 1회씩 총 2회 시행되며 수집된 자료는 오직 본 연구 목적으로만 사용되며, 응답자들의 익명성 보장을 위해 설문지 작성 후 바로 밀봉할 수 있는 봉투를 같이 동봉하오니 설문지 작성 후 바로 봉투에 넣으시어 밀봉해주시면 되겠습니다.

설문지 작성은 치매안심센터 프로그램실에서 이루어지게 될 것입니다.

자가 보고식 설문지의 내용은 연구참여자의 일반적 특성을 묻는 문항과 치매환자의 문제행동 증상, 자기효능감, 운동자기효능감, 신체기능, 부양부담감, 우울, 스트레스, 삶의 질 파트로 구성되어 있습니다. 연구 참여자에게 요구되는 설문지 응답시간은 회당 약 20분-30분이고, 자료수집동안 연구참여자에게 요구되는 처치나 준비사항은 없습니다.

실험군의 중재기간 동안은 대조군에게 별도의 프로그램을 시행하지 않고, 중재기간이 끝난 후 자발적으로 감소화된 운동프로그램을 참여할 수 있는 기회를 제공할 것입니다.

4. 연구 참여 기간은 얼마나 됩니까?

설문지 작성 예상 소요 시간은 회당 약 20분-30분으로 사전에 한번, 8주 후에 한번 시행됩니다.

5. 참여 도중 그만두어도 됩니까?

설문에 대한 참여는 자발적으로 결정하실 수 있으며 언제든지 어떠한 불이익 없이 참여 도중 그만 둘 수 있습니다.

6. 부작용이나 위험요소는 있습니까?

설문 작성으로 인한 개인정보 유출 위험이 있을 수 있으나 연구자는 개인적인 정보 유출을 막기 위해 최선을 할 것입니다. 이 연구를 통하여 얻은 귀하의 정보는 모두 코드화하여 익명으로 처리되어 철저하게 비밀이 보장됩니다. 수집된 자료는 안전성을 유지하기 위해 책임 연구자가 있는 연구실에 잠금 장치가 설치된 캐비닛에 보관하며, 설문조사 결과는 책임 연구자 이외에는 알 수 없도록 숫자로 암호화하여 설문에 응한 연구참여자의 어떠한 개인 정보는 노출되지 않도록 하겠습니다. 자료가 처리된 이후에는 자료와 숫자를 연결하는 코딩가이드를 폐기하며, 모든 자료는 안전한 저장을 위해 책임 연구자의 연구실에 있는 잠금장치가 설치된 서류함에 동의서는 3년동안 보관

하고 설문지 자료와 자료 분석 문서는 최소 5년 이상 자료를 보관하겠습니다.

7. 이 연구에 참여시 참여자에게 이득이 있습니까?

귀하가 이 연구에 참여하는데 있어서 직접적인 이득은 없습니다. 그러나 귀하가 제공하는 정보는 치매환자를 돌보는 치매환자 가족의 부담부담감, 우울, 스트레스를 낮추고 삶의 질을 증진하는데 도움이 될 것입니다.

8. 만일 이 연구에 참여하지 않는다면 불이익이 있습니까?

귀하는 본 연구에 참여하지 않을 자유가 있습니다. 또한, 귀하가 본 연구에 참여하지 않아도 귀하에게는 어떠한 불이익도 없습니다.

9. 연구에서 얻은 모든 개인 정보의 비밀은 보장됩니까?

개인정보관리책임자는 서울대학교 간호대학 박사과정생 김지연 (T. 이고 탁성희 지도교수도 개인정보(이름, 전화번호, 나이, 성별, 연령, 교육수준, 결혼상태, 가구형태, 종교, 한달수입, 직업상태, 운동여부, 건강상태, 신체정보, 치매환자와의 관계, 부양시작시기, 하루중 부양시간, 다른부양 가족수, 다른 교대자 여부, 부양비용)에 접근가능합니다. 저희는 이 연구를 통해 얻은 모든 개인 정보의 비밀 보장을 위해 최선을 다할 것입니다. 이 연구에서 얻어진 개인 정보가 학회지나 학회에 공개 될 때 귀하의 이름과 다른 개인 정보는 사용되지 않을 것입니다. 그러나 만일 법이 요구하면 귀하의 개인정보는 제공될 수도 있습니다. 또한 모니터 요원, 점검 요원, 생명윤리위원회는 연구참여자의 개인 정보에 대한 비밀 보장을 침해하지 않고 관련규정이 정하는 범위 안에서 본 연구의 실시 절차와 자료의 신뢰성을 검증하기 위해 연구 결과를 직접 열람할 수 있습니다. 귀하가 본 동의서에 서명하는 것은, 이러한 사항에 대하여 사전에 알고 있었으며 이를 허용한다는 동의로 간주될 것입니다. 연구참여자 모집과 연구진행을 위하여 수집된 개인정보(이름 및 전화번호)는 안전성을 유지하기 위해 책임 연구자가 있는 연구실에 잠금 장치가 설치된 캐비닛에 보관하여 연구참여자의 어떠한 개인 정보는 노출되지 않도록 하겠습니다. 또한 연구진행이 완료되면 즉시 폐기할 것입니다.

10. 이 연구에 참가하면 댓가가 지급됩니까?

귀하의 연구 참여시 감사의 뜻으로 10,000원 정도의 기념품 사전검사와 사



후점사 실시 후에 증명 될 것입니다.

11. 연구에 대한 문의는 어떻게 해야 됩니까?

본 연구에 대해 질문이 있거나 연구 중간에 문제가 생길 시 다음 연구 담당자에게 연락하십시오.

이름: 김지연 전화번호:

만일 어느 때라도 연구참여자로서 귀하의 권리에 대한 질문이 있다면 다음의 서울대학교 생명윤리위원회에 연락하십시오.

서울대학교 생명윤리위원회 (SNUIRB)

전화번호:



동 의 서 (연구참여자 보관용) - 대조군

연구 과제명: 제가 치매환자가족 노인부양자를 위한 운동프로그램 개발 및 효과 평가

연구 책임자명: 김지연 (서울대학교 간호대학 박사과정생)

1. 나는 이 설명서를 읽었으며 담당 연구원과 이에 대하여 의논하였습니다.
2. 나는 위험과 이득에 관하여 들었으며 나의 질문에 만족할 만한 답변을 얻었습니다.
3. 나는 이 연구에 참여하는 것에 대하여 자발적으로 동의합니다.
4. 나는 이 연구에서 얻어진 나의 대한 정보를 현행 법률과 생명윤리위원회 규정이 허용하는 범위 내에서 연구자가 수집하고 처리하는데 동의합니다.
5. 나는 담당 연구자나 위임 받은 대리인이 연구를 진행하거나 결과 관리를 하는 경우와 보건 당국, 학교 당국 및 서울대학교 생명윤리위원회가 실태 조사를 하는 경우에는 비밀로 유지되는 나의 개인 신상 정보를 직접적으로 열람하는 것에 동의합니다.
6. 나는 언제라도 이 연구의 참여를 철회할 수 있고 이러한 결정이 나에게 어떠한 해도 되지 않을 것이라는 것을 압니다.
7. 나의 서명은 이 동의서의 사본을 받았다는 것을 뜻하며 연구 참여가 끝날 때까지 사본을 보관하겠습니다.

연구 참여자 성명	서명	날짜 (년/월/일)
동의서 받은 연구원 성명	서명	날짜 (년/월/일)
연구책임자 성명	서명	날짜 (년/월/일)



[민감정보 수집동의]

- 본 연구는 개인정보보호법 제23조에 따라 개인정보에 대한 개별 동의 사항에 대하여 귀하의 민감정보(연구참여자의 병력, 치매환자의 진단명, 치매환자의 병력)에 대한 정보를 처리(수집, 이용 등) 하고자 합니다. 이에 대하여 동의 하십니까?
- 나는 민감정보 처리에 대하여 동의합니다.

 연구참여자 성명

 서명

 날짜 (년/월/일)

 동의받는 연구원 성명

 서명

 날짜 (년/월/일)

연구참여자용 설명서 및 동의서 - 실험군

연구 과제명: 치매환자가족 노인부양자를 위한 운동프로그램 개발 및 효과평가

연구 책임자명: 김지연 (서울대학교 간호대학 박사과정생)

이 연구는 치매안심센터를 이용하는 치매환자가족부양자를 위한 통합적 운동프로그램을 개발하고 그 효과를 평가하고자 시행되는 연구입니다. 본 연구는 치매안심센터를 등록하고 이용하는 치매환자가족중 60세 이상 노인 66여명을 대상으로 하는 중재연구이기 때문에 귀하는 이 연구에 참여하도록 권유받았습니다. 이 연구를 수행하는 서울대학교 소속의 김지연 연구원(T.

이 귀하에게 이 연구에 대해 설명해 줄 것입니다. 이 연구는 자발적으로 참여 의사를 밝히신 분에 한하여 수행 될 것이며, 귀하께서는 참여 의사를 결정하기 전에 본 연구가 왜 수행되는지 그리고 연구의 내용이 무엇과 관련 있는지 이해하는 것이 중요합니다. 다음 내용을 신중히 읽어보신 후 참여 의사를 밝혀 주시길 바라며, 필요하다면 가족이나 친구들과 의논해 보십시오. 만일 어떠한 질문이 있다면 담당 연구원이 자세하게 설명해 줄 것입니다.

1. 이 연구는 왜 실시합니까?

치매환자와 그들을 돌보는 치매환자 가족들이 급증하고 있는 치매안심센터를 중심으로 지역사회에 거주하는 치매노인 가족부양자가 본인의 건강관리를 유지하도록 지속적인 운동의 필요성과 운동방법을 보호자들에게 직접 교육하는 프로그램 개발 및 보급이 절실히 요구되고 있으므로 치매안심센터를 등록하고 이용하는 치매환자의 가족들을 위한 통합적 운동프로그램을 개발하고 그 효과를 평가하고자 합니다.

2. 얼마나 많은 사람이 참여합니까?

본 연구의 선정기준에 의해 선정된 치매환자 가족 66여명이 참여할 것입니다. 이 중 33명은 대조군으로 배정되고, 나머지 33명은 실험군으로 배정될 것입니다. 8주 프로그램을 모두 참석할 수 있는지 여부를 물어보고, 프로그램 8주 모두 참석할 수 있는 연구참여자는 실험군으로 배정하고, 8주 모두 참석하지 못하는 연구참여자들은 대조군으로 배정할 것입니다.



3. 만일 연구에 참여하면 어떤 과정이 진행됩니까?

설문작성은 프로그램 참여 전후 1회씩 총 2회 시행되며 수집된 자료는 오직 본 연구 목적으로만 사용되며, 응답자들의 익명성 보장을 위해 설문지 작성 후 바로 탈퇴할 수 있는 봉투를 같이 동봉하오니 설문지 작성 후 바로 봉투에 넣으셔서 탈퇴해주시면 되겠습니다.

설문지 작성은 치매안심센터 프로그램실에서 이루어지게 될 것입니다.

자가 보고식 설문지의 내용은 연구참여자의 일반적 특성을 묻는 문항과 치매환자의 문제행동 증상, 자기효능감, 운동자기효능감, 신체기능, 부양부담감, 우울, 스트레스, 삶의 질 파트로 구성되어 있습니다. 연구 참여자에게 요구되는 설문지 응답시간은 회당 약 20분~30분이고, 자료수집동안 연구참여자에게 요구되는 처치나 준비사항은 없습니다.

실험군은 총 8주 동안 통합적 운동프로그램이 진행되며 회기당 60분이 소요되는 주1회 운동프로그램과, 10분이 소요되는 주1회 전화중재가 있을 예정입니다. 통합적 운동프로그램을 통해 노인에게 적합한 운동(유연성, 근력, 평형성)과 운동에 대한 지식을 배우고, 설정하는 목표를 달성하고, 운동을 통해 느낀점들을 공유함으로써 운동자기효능감을 향상시킬 수 있도록 할 것입니다.

4. 연구 참여 기간은 얼마나 됩니까?

설문지 작성 예상 소요 시간은 회당 약 20분~30분으로 프로그램 참여 전후 시행되며 8주 간, 회기당 60분이 소요되는 주1회 운동프로그램과, 10분이 소요되는 주1회 전화중재에 참여하게 됩니다.

5. 참여 도중 그만두어도 됩니까?

설문에 대한 참여는 자발적으로 결정하실 수 있으며 언제든지 어떠한 불이익 없이 참여 도중 그만 둘 수 있습니다.

6. 부작용이나 위험요소는 있습니까?

설문 작성으로 인한 개인정보 유출 위험이 있을 수 있으나 연구자는 개인적인 정보 유출을 막기 위해 최선을 할 것입니다. 이 연구를 통하여 얻은 귀하의 정보는 모두 코드화하여 익명으로 처리되어 철저하게 비밀이 보장됩니다. 수집된 자료는 안전성을 유지하기 위해 책임 연구자가 있는 연구실에 잠금 장치가 설치된 캐비닛에 보관하며, 설문조사 결과는 책임 연구자 이외에는 알 수 없도록 숫자로 암호화하여 설문에 응한 연구참여자의 어떠한 개인

정보는 노출되지 않도록 하겠습니다. 자료가 처리된 이후에는 자료와 숫자를 연결하는 코딩가이드를 폐기하며, 모든 자료는 안전한 저장을 위해 책임 연구자의 연구실에 있는 잠금장치가 설치된 서류함에 동의서는 3년동안 보관하고 설문지 자료와 자료 분석 문서는 최소 5년 이상 자료를 보관하겠습니다.

7. 이 연구에 참여시 참여자에게 이득이 있습니까?

귀하가 이 연구에 참여하는데 있어서 직접적인 이득은 없습니다. 그러나 귀하가 제공하는 정보는 치매환자를 돌보는 치매환자 가족의 부담부담감, 우울, 스트레스를 낮추고 삶의 질을 증진하는데 도움이 될 것입니다.

8. 만일 이 연구에 참여하지 않는다면 불이익이 있습니까?

귀하는 본 연구에 참여하지 않을 자유가 있습니다. 또한, 귀하가 본 연구에 참여하지 않아도 귀하에게는 어떠한 불이익도 없습니다.

9. 연구에서 얻은 모든 개인 정보의 비밀은 보장됩니까?

개인정보관리책임자는 서울대학교 간호대학 박사과정생 김지연 (T. 이고 박성희 지도교수도 개인정보(이름, 전화번호, 나이, 성별, 연령, 교육수준, 결혼상태, 가구형태, 종교, 한달수입, 직업상태, 운동여부, 건강상태, 신체정보, 치매환자와의 관계, 부양시작시기, 하루중 부양시간, 다른부양 가족수, 다른 교대자 여부, 부양비용)에 접근가능합니다. 저희는 이 연구를 통해 얻은 모든 개인 정보의 비밀 보장을 위해 최선을 다할 것입니다. 이 연구에서 얻어진 개인 정보가 학회지나 학회에 공개 될 때 귀하의 이름과 다른 개인 정보는 사용되지 않을 것입니다. 그러나 만일 법이 요구하면 귀하의 개인정보는 제공될 수도 있습니다. 또한 모니터 요원, 점검요원, 생명윤리위원회는 연구참여자의 개인 정보에 대한 비밀 보장을 침해하지 않고 관련규정이 정하는 범위 안에서 본 연구의 실시 절차와 자료의 신뢰성을 검증하기 위해 연구 결과를 직접 열람할 수 있습니다. 귀하가 본 동의서에 서명하는 것은, 이러한 사항에 대하여 사전에 알고 있었으며 이를 허용한다는 동의로 간주될 것입니다. 연구참여자 모집과 연구진행을 위하여 수집된 개인정보(이름 및 전화번호)는 안전성을 유지하기 위해 책임 연구자가 있는 연구실에 잠금 장치가 설치된 캐비닛에 보관하여 연구참여자의 어떠한 개인 정보는 노출되지 않도록 하겠습니다. 또한 연구진행이 완료되면 즉시 폐기할 것입니다.

10. 이 연구에 참가하면 댓가가 지급됩니까?

귀하의 연구 참여시 감사의 뜻으로 10,000원 정도의 기념품 사전검사와 사후검사 실시 후에 증정 될 것입니다. 또한, 폐회기 운동프로그램이 마치면 스트레칭 밴드, 두유, 견과류 등과 같은 소정의 선물이 증정 될 것입니다.

11. 연구에 대한 문의는 어떻게 해야 됩니까?

본 연구에 대해 질문이 있거나 연구 중간에 문제가 생길 시 다음 연구 담당자에게 연락하십시오.

이름: 김지연 전화번호:

만일 어느 때라도 연구참여자로서 귀하의 권리에 대한 질문이 있다면 다음의 서울대학교 생명윤리위원회에 연락하십시오.

서울대학교 생명윤리위원회 (SNUIRB) 전화번호:



동 의 서 (연구참여자 보관용) - 실험군

연구 과제명: 재가 치매환자가족 노인부양자를 위한 운동프로그램 개발 및 효과평가

연구 책임자명: 김지연 (서울대학교 간호대학 박사과정생)

1. 나는 이 설명서를 읽었으며 담당 연구원과 이에 대하여 의논하였습니다.
2. 나는 위험과 이득에 관하여 들었으며 나의 질문에 만족할 만한 답변을 얻었습니다.
3. 나는 이 연구에 참여하는 것에 대하여 자발적으로 동의합니다.
4. 나는 이 연구에서 얻어진 나의 정보에 대한 정보를 현행 법률과 생명윤리위원회 규정이 허용하는 범위 내에서 연구자가 수집하고 처리하는데 동의합니다.
5. 나는 담당 연구자나 위임 받은 대리인이 연구를 진행하거나 결과 관리를 하는 경우와 보건 당국, 학교 당국 및 서울대학교 생명윤리위원회가 실태 조사를 하는 경우에는 비밀로 유지되는 나의 개인 신상 정보를 직접적으로 열람하는 것에 동의합니다.
6. 나는 언제든지 이 연구의 참여를 철회할 수 있고 이러한 결정이 나에게 어떠한 해도 되지 않을 것이라는 것을 압니다.
7. 나의 서명은 이 동의서의 사본을 받았다는 것을 뜻하며 연구 참여가 끝날 때까지 사본을 보관하겠습니다.

연구 참여자 성명	서명	날짜 (년/월/일)
동의서 받은 연구원 성명	서명	날짜 (년/월/일)
연구책임자 성명	서명	날짜 (년/월/일)



[민감정보 수집동의]

- 본 연구는 개인정보보호법 제23조에 따라 개인정보에 대한 개별 동의 사항에 대하여 귀하의 민감정보(연구참여자의 병력, 치매환자의 진단명, 치매환자의 병력)에 대한 정보를 처리(수집, 이용 등) 하고자 합니다. 이에 대하여 동의 하십니까?
- 나는 민감정보 처리에 대하여 동의합니다.

 연구참여자 성명

 서 명

 날짜 (년/월/일)

 동의받는 연구원 성명

 서 명

 날짜 (년/월/일)

Appendix 4. Questionnaire

1. 보호자의 일반적 특성

다음은 보호자에 대한 일반적 정보에 대해 묻는 질문입니다.

성별	①남성 ②여성																
연령	만 ()세, 또는 생년월일: ()년 ()월 ()일																
교육 수준	학교에 다녔던 가장 고학년에 ○ 표시하세요. 예) 중학교 2학년까지 다닌 경우 8에 표시																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17+
	초등학교					중학교			고등학교				대학교				대학원 이상
결혼 상태	(한가지에만 표시) ①기혼 ②별거 ③사별 ④미혼 ⑤이혼																
가구 형태	①노인부부 ②자녀동거 ③친척 또는 지인 동거 ④기타 ()																
종교	①불교 ②개신교(기독교) ③천주교 ④유교 ⑤원불교 ⑥없음 ⑦기타 ()																
한달 수입	①99만 이하 ②100~199만원 ③200~299만원 ④300~399만원 ⑤400~499만원 ⑥500만원 이상																
직업 상태	①없음 ②없음 (시간제/정규직/기타_____)																
운동 여부	①예: 일주일에 ____회, 1회당 ____분 ②아니요																
건강 상태	①매우 좋음 ②좋음 ③보통 ④나쁨 ⑤매우 나쁨																
질병 여부	현재 앓고 있는 질환을 모두 쓰세요 _____																

2. 부양관련 특성

다음은 부양관련특성에 대한 정보를 묻는 질문입니다.

환자와 관계	①배우자 ②딸 ③며느리 ④기타()
부양시작시기	년 월
하루 중 부양시간	시간
다른부양 가족수	예) 자녀 명
다른 교대자 여부	①없음 ②늘 있음(누구:) ③가끔 있음(누구:)
부양비용(한달)	약 만원

3. 치매환자상태

다음은 치매환자와 관련된 정보를 묻는 질문입니다.

환자 성별	①남성 ②여성																																																			
환자 연령	만 ()세, 또는 생년월일: ()년 ()월 ()일																																																			
환자 교육 수준	환자가 학교에 다녔던 가장 고학년에 ○ 표시하세요. 예) 중학교 2학년까지 다닌 경우 8에 표시 <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17+</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td colspan="6">초등학교</td> <td colspan="2">중학교</td> <td colspan="4">고등학교</td> <td colspan="4">대학교</td> <td>대학원 이상</td> </tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17+																		초등학교						중학교		고등학교				대학교				대학원 이상
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17+																																				
초등학교						중학교		고등학교				대학교				대학원 이상																																				
환자 결혼 상태	(한가지에만 표시) ①기혼 ②별거 ③사별 ④미혼 ⑤이혼																																																			
치매 진단	치매 진단명 치매 진단날짜 년 월																																																			
다른 질병	치매 외 갖고있는 질병(모두) 																																																			

4. 환자의 문제행동

지난 일주일 동안 환자가 다음의 어려움을 보인 횟수를 ○ 해주세요.

- ① = 지금까지 한번도 없었다
 ② = 지난 일주일 동안에는 없었다
 ③ = 지난 일주일 동안 1~2회 있었다.
 ④ = 지난 일주일 동안 3~6회 있었다.
 ⑤ = 매일 그런 행동을 보였다.

	내용	횟수
1	같은 질문을 반복해서 물어본다.	① ② ③ ④ ⑤
2	최근의 일(예를 들어, 신문이나 텔레비전에서 본 내용)을 기억하기 힘들어한다.	① ② ③ ④ ⑤
3	과거에 있었던 중요한 일들을 기억하기 힘들어한다.	① ② ③ ④ ⑤
4	물건을 잃어버리거나 엉뚱한 곳에 둔다.	① ② ③ ④ ⑤
5	날짜나 요일을 잊어버린다.	① ② ③ ④ ⑤
6	어떤 일을 시작한 하지만, 끝맺지 못한다.	① ② ③ ④ ⑤
7	한 가지 일에 집중하는 것이 어렵다.	① ② ③ ④ ⑤
8	물건을 던지거나, 발로 차거나, 때려부순다.	① ② ③ ④ ⑤
9	보호자를 당황시키는 일을 한다.	① ② ③ ④ ⑤
10	저녁에 자고 있는 가족들을 깨운다.	① ② ③ ④ ⑤
11	큰소리로 말하며, 빠르게 말한다.	① ② ③ ④ ⑤
12	불안해 보이거나, 걱정스러운 듯 보인다.	① ② ③ ④ ⑤
13	환자 자신이나 다른 사람들에게 위협한 일이나 행동을 한다.	① ② ③ ④ ⑤
14	자해하거나 자살하겠다고 위협한다.	① ② ③ ④ ⑤
15	다른 사람에게 해를 입히겠다고 위협한다.	① ② ③ ④ ⑤
16	다른 사람에게 욕이나 과격한 말을 한다.	① ② ③ ④ ⑤
17	술취 보이거나, 우울해 보인다.	① ② ③ ④ ⑤
18	미래에 대한 희망이 없다는 느낌이나 슬픈 기분을 표현한다 (예를 들어, 의미있는 일이 없다. 나는 어떤 일도 잘 해낼 수 없다고 말할)	① ② ③ ④ ⑤
19	소리 내어 울거나, 눈물을 흘린다.	① ② ③ ④ ⑤
20	자신이나 다른 사람의 죽음에 대해 이야기한다. (예를 들어, 인생이 살 가치가 없다, 차라리 죽는게 낫겠다고 말한다)	① ② ③ ④ ⑤
21	외롭다고 말한다.	① ② ③ ④ ⑤
22	자신이 가치가 없다거나 다른 사람에게 짐이 된다고 이야기한다.	① ② ③ ④ ⑤
23	인생에서 이룬 것이 없다거나 실패한 것 같다는 느낌에 대해 이야기한다.	① ② ③ ④ ⑤
24	쉽게 흥분하거나 화를 내며, 무정을 부린다.	① ② ③ ④ ⑤

5. 자기관리 - 자기효능감

다음은 현재의 자기효능감에 대한 질문입니다.

본인과 가장 가깝게 표현된 곳에 ○ 해주세요.

	내용	전혀 그렇지 않다	대체로 그렇지 않다	대체로 그렇다	항상 그렇다
1	지역사회(주변)에서 내가 운동할 수 있는 장소를 찾을 수 있다.	①	②	③	④
2	운동을 규칙적으로 할 수 있다.	①	②	③	④
3	내가 좋아하는 운동을 찾을 수 있다.	①	②	③	④
4	스트레칭 운동을 할 수 있다.	①	②	③	④
5	나에게 유익한 운동을 할 수 있다.	①	②	③	④
6	내가 받는 스트레스를 줄이기 위해 나의 삶을 변화시킬 수 있다.	①	②	③	④
7	나를 괴롭히는 것에 대해 친구와 가족에게 이야기 할 수 있다.	①	②	③	④
8	매일 내가 마셔야 될 양만큼의 물을 마실 수 있다.	①	②	③	④
9	건강해지려면 내 체중이 얼마나 되어야 하는지 계산 할 수 있다.	①	②	③	④
10	내가 받는 스트레스에 어떻게 대응해야 하는지 알 수 있다.	①	②	③	④
11	나에게 좋은 음식을 고를 수 있다.	①	②	③	④
12	다치지 않고 운동 할 수 있다.	①	②	③	④
13	스스로 외로움을 느끼지 않도록 할 수 있다.	①	②	③	④
14	나 자신을 이완시킬 수 있는 방법을 찾아낼 수 있다.	①	②	③	④
15	어떤 음식에 섬유소가 많이 들어있는지 말할 수 있다.	①	②	③	④
16	균형 잡힌 식사를 할 수 있다.	①	②	③	④
17	운동을 언제 그만 해야 하는지 알 수 있다.	①	②	③	④
18	내 건강을 돌보기 위한 정보를 어디서 얻어야 되는지 알 수 있다.	①	②	③	④
19	내 경제력으로 구입할 수 있는 건강식품을 찾을 수 있다.	①	②	③	④

20	지루해지는 것을 피할 수 있다.	①	②	③	④
21	내 자신을 기분 좋게 만드는 일을 할 수 있다.	①	②	③	④
22	도움이 필요할 때 다른 사람에게서 도움을 구할 수 있다.	①	②	③	④
23	건강에 대해 충고해 줄 의사나 간호사를 찾을 수 있다.	①	②	③	④
24	내 몸에 나쁜 변화가 오는지를 발견해 낼 수 있다.	①	②	③	④
25	어떤 증상이 생길 때 의사나 간호사에게 말해야 하는지 알 수 있다.	①	②	③	④
26	나의 권리를 알고 효과적으로 주장할 수 있다.	①	②	③	④
27	규칙적으로 이를 닦을 수 있다.	①	②	③	④
28	약을 올바르게 사용할 수 있다.	①	②	③	④

8. 운동 자기효능감

귀하는 아래에 주어진 상황에서 얼마나 규칙적으로 (주3회 이상) 운동을 할 수 있다고 확신하는지 해당하는 점수에 ○ 표를 하여 주십시오. 다음 보기와 같이 확신하는 정도가 높을수록 점수가 높습니다.

(보기)

0	10	20	30	40	50	60	70	80	90	100
↓					↓					↓
전혀 할 수 없다					보통으로 확신 할 수 있다					확실하게 할 수 있다

문항		점수										
1	피곤하다고 느낄 때	0	10	20	30	40	50	60	70	80	90	100
2	해야 할 일로 인해 부담을 느낄 때	0	10	20	30	40	50	60	70	80	90	100
3	날씨가 안 좋을 때	0	10	20	30	40	50	60	70	80	90	100
4	몸이 다쳐서 운동을 중단했다가 회복한 뒤에	0	10	20	30	40	50	60	70	80	90	100
5	개인적인 어려움이 있거나 어려움을 겪고 난 후에	0	10	20	30	40	50	60	70	80	90	100
6	우울할 때	0	10	20	30	40	50	60	70	80	90	100
7	불안할 때	0	10	20	30	40	50	60	70	80	90	100
8	질병에 걸려 운동을 중단했다가 회복한 뒤에	0	10	20	30	40	50	60	70	80	90	100
9	운동시 신체적으로 불편함을 느낄 때	0	10	20	30	40	50	60	70	80	90	100
10	휴가 후에	0	10	20	30	40	50	60	70	80	90	100
11	집에 할 일이 아주 많을 때	0	10	20	30	40	50	60	70	80	90	100
12	방문객이 있을 때	0	10	20	30	40	50	60	70	80	90	100
13	흥미있는 다른 할일이 있을 때	0	10	20	30	40	50	60	70	80	90	100
14	내가 세운 운동 목표에 도달하지 못할 경우	0	10	20	30	40	50	60	70	80	90	100
15	내가 운동할 수 있도록 가족이나 친구가 날 지지해 주지 않을 때	0	10	20	30	40	50	60	70	80	90	100
16	휴가 동안	0	10	20	30	40	50	60	70	80	90	100
17	시간을 쉴어야 할 다른 일이 있을 때	0	10	20	30	40	50	60	70	80	90	100
18	가족간의 어려움을 겪은 후에	0	10	20	30	40	50	60	70	80	90	100

7. 신체기능

간이신체활동능력검사 (SPPB)				
반복적 의자에서 일어났다 앉기 (5회)	횟수	시간(초)		점수
균형검사	일반자세 (side by side)	반일렬자세 (semi tandem)	일렬자세 (tandem)	점수
	10초 유지 (O, X)	10초 유지 (O, X)	()초	
보행속도 (4m)	O, X	1차(초)	2차(초)	점수
총점				

키	몸무게	Inbody 시행
() cm	() kg	(O, X)

8. 돌봄 부담감

다음은 귀하가 환자분을 돌볼 때 느낄 수 있는 감정에 대한 내용입니다. 각 문항을 읽으신 후 평소에 느끼시는 정도에 점수를 매겨 주십시오.

	문항	0= 전혀	1= 드물	2= 가끔	3= 자주	4= 항상
1	환자분이 필요 이상의 도움을 요구한다고 느끼십니까?	①	①	②	③	④
2	환자분과 함께 보내는 시간이 때문에 자기 시간이 충분치 않다고 느끼십니까?	①	①	②	③	④
3	환자분을 부양하면서 다른 일들을 함께 하는데 스트레스를 느끼십니까?	①	①	②	③	④
4	환자분의 행동 때문에 창피를 당한다고 느끼십니까?	①	①	②	③	④
5	환자분과 함께 있을 때는 화가 나십니까?	①	①	②	③	④
6	환자분 때문에 현재 친척이나 친구들과의 관계가 나빠진다고 느끼십니까?	①	①	②	③	④
7	환자분이 앞으로 어떻게 될까 걱정하십니까?	①	①	②	③	④
8	환자분이 당신에게 의존한다고 느끼십니까?	①	①	②	③	④
9	환자분과 함께 있을 때는 힘들습니까?	①	①	②	③	④
10	환자분과의 관계 때문에 당신의 건강이 나빠졌다고 느끼십니까?	①	①	②	③	④
11	환자분 때문에 개인생활을 원하는 만큼 갖지 못한다고 느끼십니까?	①	①	②	③	④
12	환자분을 부양하기 때문에 사회생활을 제대로 못한다고 느끼십니까?	①	①	②	③	④
13	환자분 때문에 친구들을 집에 초대하기가 불편하다고 느끼십니까?	①	①	②	③	④
14	환자분은 마치 당신이 의지할 수 있는 유일한 사람인 것처럼, 당신이 부양해주기를 기대하는 것 같습니다.	①	①	②	③	④
15	생활비를 때면 부양 비용이 충분치 않다고 느끼십니까?	①	①	②	③	④
16	환자분을 더 이상 부양 할 수 없을 것 같다고 느끼십니까?	①	①	②	③	④
17	환자분이 아픈 이후로 당신의 삶은 엉망이	①	①	②	③	④

	되었다고 느끼십니까?					
18	환자분의 부양을 다른 사람에게 맡겼으면 하십니까?	①	①	②	③	④
19	환자분을 어떻게 해야 할지 확신하지 못하십니까?	①	①	②	③	④
20	환자분에게 뭔가 더 해드려야 한다고 느끼십니까?	①	①	②	③	④
21	환자분을 좀 더 잘 부양할 수도 있다고 느끼십니까?	①	①	②	③	④
		아주 조금	조금	보통	많이	아주 많이
22	전체적으로, 환자분을 부양하기가 얼마나 부담되십니까?	①	①	②	③	④

9. 우울

지난 일주일간 어르신께서 아래와 같은 느낌을 가졌으면 ‘예’에 표시하시고, 그렇지 않으면 ‘아니오’에 표시해주시시오.

지난 한 주 동안의 느낌		대답	
1	당신은 평소 자신의 생활에 만족합니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
2	당신의 활동과 흥미가 많이 저하되었습니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
3	당신은 앞날에 대해서 희망적입니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
4	당신은 대부분의 시간을 맑은 정신으로 지냅니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
5	당신은 대부분의 시간이 행복하다고 느낍니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
6	당신은 지금 살아있다는 것이 아름답다고 생각합니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
7	당신은 가끔 낙담하고 우울하다고 느낍니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
8	당신은 지금 자신의 인생이 매우 가치가 없다고 느낍니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
9	당신은 인생이 매우 흥미롭다고 느낍니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
10	당신은 활력이 충분하다고 느낍니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
11	당신은 자주 사소한 일에 마음의 동요를 느낍니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
12	당신은 자주 울고 싶다고 느낍니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
13	당신은 아침에 일어나는 것이 즐겁습니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
14	당신은 결정을 내리는 것이 수월합니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요
15	당신의 마음은 이전처럼 편안합니까?	<input type="checkbox"/> 예	<input type="checkbox"/> 아니요

10. 스트레스

다음 문항들은 여러분의 스트레스 지각 정도를 나타내는 것이며, 최근 한 달간의 일을 회상하면서 해당되는 번호에 표시를 해주세요.

	문항	전혀 없었다	거의 없었다	가끔 있었 다	꽤 자주 있었다	대우 자주 있었다
1	초조하거나 스트레스가 쌓인다고 느낀 적은 얼마나 있나요?	①	①	②	③	④
2	예상치 못한 일이 생겨서 기분 나빠진 적이 얼마나 있었나요?	①	①	②	③	④
3	당신이 통제할 수 없는 범위에서 발생한 일 때문에 화가 난적이 얼마나 있었나요?	①	①	②	③	④
4	중요한 일들을 통제할 수 없다고 느낀 적은 얼마나 있었나요?	①	①	②	③	④
5	어려운 일이 너무 많이 쌓여서 극복할 수 없다고 느낀 적은 얼마나 있었나요?	①	①	②	③	④
6	매사를 잘 컨트롤하고 있다고 느낀 적이 얼마나 있었나요?	①	①	②	③	④
7	개인적인 문제를 처리하는 능력에 대해 자신감을 느낀 적은 얼마나 있었나요?	①	①	②	③	④
8	자신의 뜻대로 일이 진행된다고 느낀 적은 얼마나 있었나요?	①	①	②	③	④
9	생활 속에서 일어난 중요한 변화들을 효과적으로 대처한 적이 얼마나 있었나요?	①	①	②	③	④
10	짜증나고 성가신 일들을 성공적으로 처리한 적이 얼마나 있었나요?	①	①	②	③	④

11. 삶의 질

다음은 귀하의 건강관련 삶의 질에 관한 질문입니다.

다음은 귀하의 삶의 질과 건강 및 인생의 여러 영역들에 대해 귀하가 어떻게 느끼는지 묻는 질문들입니다. 빠뜨리는 문항 없이 모든 문항에 답변하여 주십시오. 만일 질문에 대한 답이 불확실할 경우, 가장 적합해 보이는 답변을 하나 고르십시오.

각 질문을 읽은 후, 지난 2주 동안 당신의 느낌을 평가하고 각 문항마다 귀하에게 가장 적합한 1개의 번호를 골라 체크해 주십시오.

	질문내용	매우 나쁨	나쁨	보통	좋음	매우 좋음
1	당신은 당신의 삶의 질을 어떻게 평가하십니까?	①	②	③	④	⑤
2	당신은 자신의 건강상태를 어떻게 평가하십니까?	①	②	③	④	⑤
3	당신은 신체적 통증으로 인해 해야 할 일을 방해받는다고 느낍니까?	①	②	③	④	⑤
4	당신은 일상생활을 잘 하기 위해 치료가 필요합니까?	①	②	③	④	⑤
5	당신은 인생을 얼마나 즐기십니까?	①	②	③	④	⑤
6	당신은 당신의 삶이 의미 있다고 느끼십니까?	①	②	③	④	⑤
7	당신은 얼마나 정신을 잘 집중할 수 있습니까?	①	②	③	④	⑤
8	당신은 일상생활에서 안전하다고 느낍니까?	①	②	③	④	⑤
9	당신은 건강에 좋은 주거환경에 살고 있습니까?	①	②	③	④	⑤
10	당신은 일상생활을 하기에 충분한 기력(에너지)이 있습니까?	①	②	③	④	⑤
11	당신은 자신의 신체적 외모에 만족하십니까?	①	②	③	④	⑤
12	당신은 필요한 만큼 충분한 돈을 가지고 있습니까?	①	②	③	④	⑤
13	당신은 매일의 생활에 필요한 정보를 쉽게 얻을 수 있습니까?	①	②	③	④	⑤
14	여가를 즐길 기회를 가지고 있습니까?	①	②	③	④	⑤
15	당신은 자신의 수면에 대해 만족하고 있습니까?	①	②	③	④	⑤
16	당신은 자신의 일상생활수행 능력에 대해 만족하십니까?	①	②	③	④	⑤
17	당신은 자신의 일하는 능력에 대해 만족하십니까?	①	②	③	④	⑤
18	당신은 자신에 대해 얼마나 만족하십니까?	①	②	③	④	⑤
19	당신은 자신의 대인관계에 대해 만족하십니까?	①	②	③	④	⑤

20	당신은 자신의 성생활에 대해 만족하십니까?	①	②	③	④	⑤
21	당신은 친구의 도움에 대해 만족하십니까?	①	②	③	④	⑤
22	당신이 살고 있는 집과 주변 환경에 대해 만족하십니까?	①	②	③	④	⑤
23	의료서비스를 쉽게 받을 수 있다는 점에 만족하십니까?	①	②	③	④	⑤
24	당신은 당신이 이용하는 교통수단에 만족하십니까?	①	②	③	④	⑤
25	당신은 잘 돌아다닐 수 있습니까?	①	②	③	④	⑤
26	당신은 우울함, 절망감, 불안감, 의기소침 등과 같은 부정적인 감정을 자주 느낍니까?	①	②	③	④	⑤

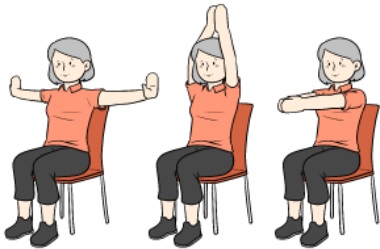
()

슈퍼맨 운동 일기



Movements of stretching exercise (example)

어깨 올렸다 내리기 & 어깨 돌리기



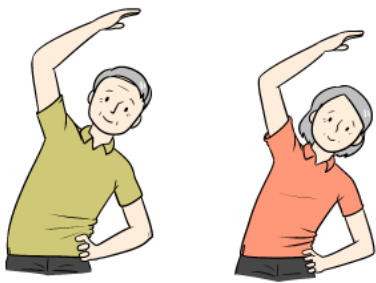
어깨 올렸다 내리는 동작과 돌리기 동작을 반복합니다.

목 스트레칭



목 반대쪽 어깨가 올라가지 않도록 좌우로 스트레칭 하세요.

옆구리 스트레칭



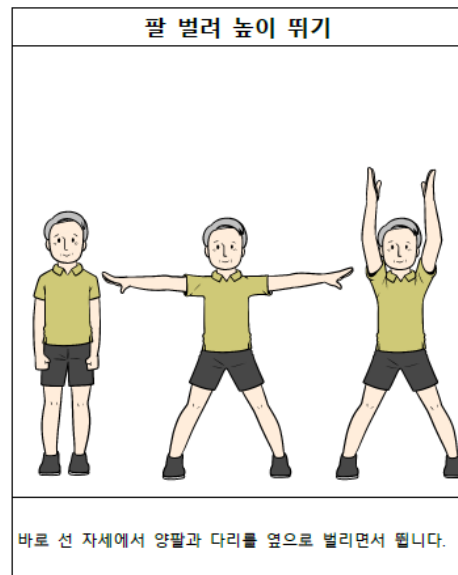
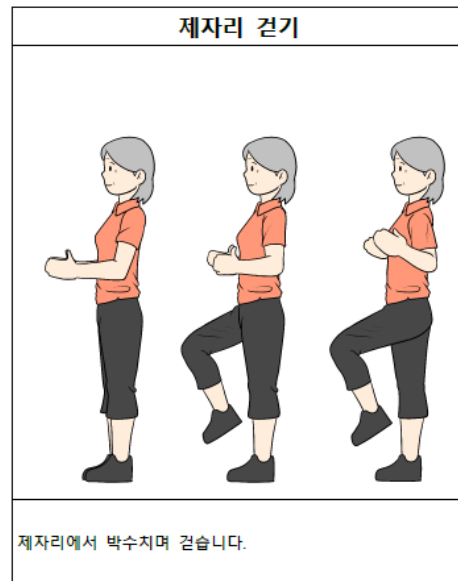
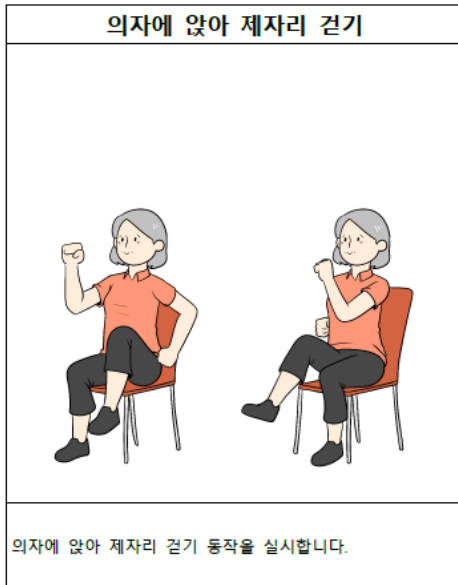
하체와 골반을 고정한 다음 겨드랑이부터 옆구리 근육이 늘어날도록 당겨줍니다.

허리와 팔 스트레칭

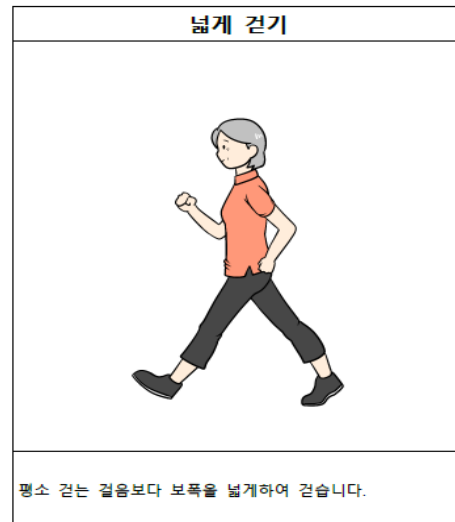
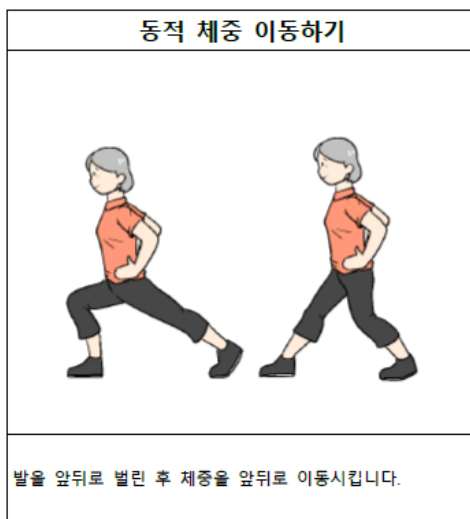
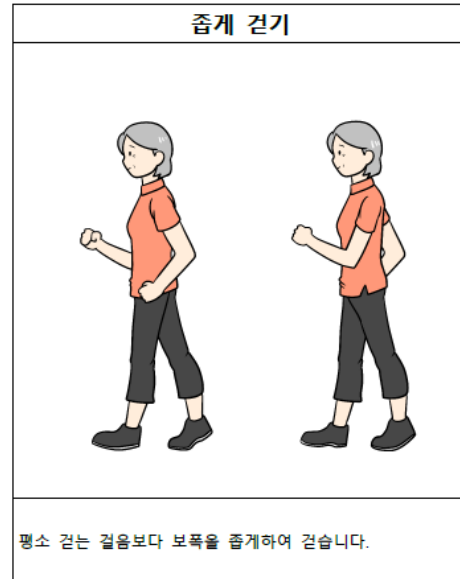
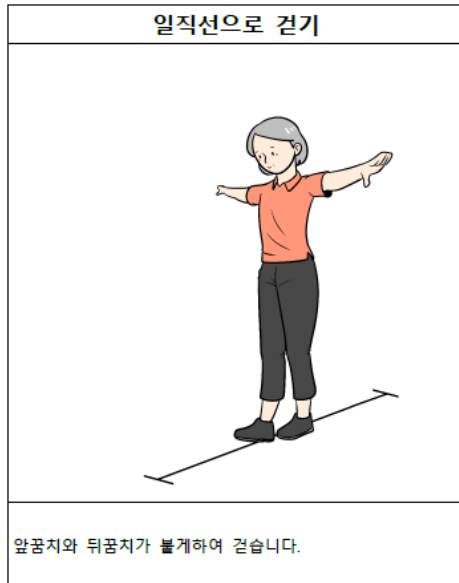


허리와 팔 스트레칭을 위해 팔을 깎지 낀채로 허리 뒤쪽으로 쭉 뻗니다.
좌우로 늘어줍니다.

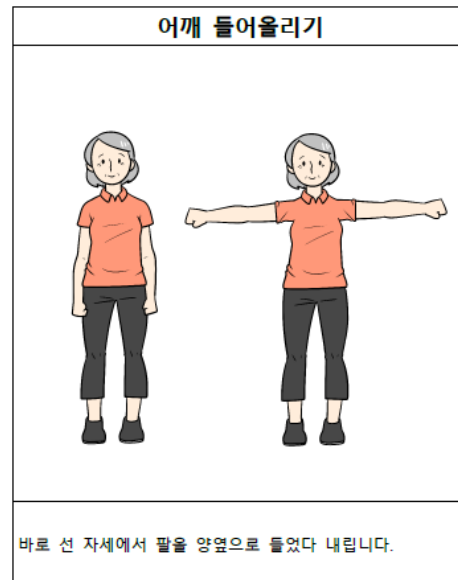
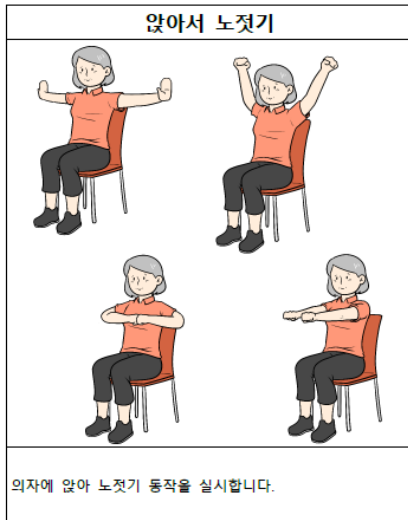
Movements of cardiovascular exercise (example)



Movements of balancing exercise (example)



Movements of strengthening exercise (example)



Week 1 (example)

Recording sheet of physical exercise goal

이번주 운동목표			
1 주	월	일	요일 ~ 월 일 요일
요일	운동시간	운동종류	
()요일			
()요일			
()요일			
()요일			
()요일			
()요일			
()요일			
(운동안함, 30분 이하, 30-60분, 1시간-2시간, 3시간 이상)			
(유연성 운동, 심폐지구력 운동, 기타)			
비 고			

Daily physical exercise diary

1 주	월	일	요일
운동시간			
오늘 얼마나 운동하셨어요?	운동 안함		
	30분 이하		
	30분-60분		
	1시간-2시간		
	2시간-3시간		
	3시간 이상		
운동의 종류			
어떤 운동 하셨어요?	유연성 운동		
	심폐지구력 운동		
	기타 운동		
비 고			

Week 2 (example)

Recording sheet of physical exercise goal

이번주 운동목표			
2 주	월 일 요일 ~ 월 일 요일		
요일	운동시간	운동종류	
()요일			
()요일			
()요일			
()요일			
()요일			
()요일			
()요일			
()요일			
(운동안함, 30분 이하, 30-60분, 1시간-2시간, 3시간 이상)			
(유연성 운동, 심폐지구력 운동, 평형성 운동, 기타)			
비 고			

Daily physical exercise diary

2 주	월 일 요일	
운동시간		
오늘 얼마나 운동하셨어요?	운동 안함	
	30분 이하	
	30분-60분	
	1시간-2시간	
	2시간-3시간	
	3시간 이상	
운동의 종류		
어떤 운동 하셨어요?	유연성 운동	
	심폐지구력 운동	
	평형성 운동	
	기타 운동	
비 고		

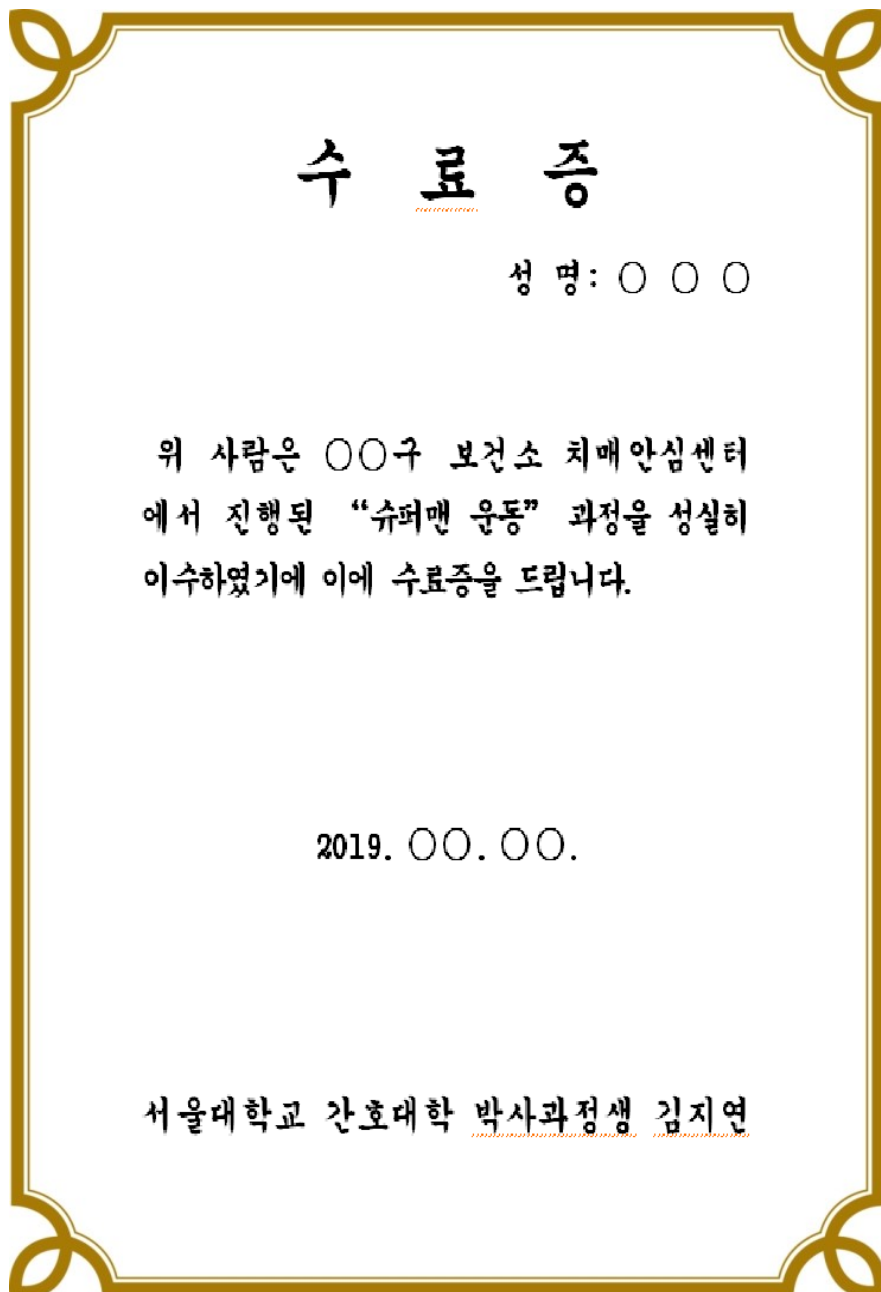
Week 3 ~Week 8 (example)

Recording sheet of physical exercise goal

이번주 운동목표			
3 주	월 일 요일 ~ 월 일 요일		
요일	운동시간	운동종류	
()요일			
()요일			
()요일			
()요일			
()요일			
()요일			
()요일			
()요일			
(운동안함, 30분 이하, 30-60분, 1시간-2시간, 3시간 이상)			
(유연성 운동, 심폐지구력, 평형성 운동, 근력강화 운동, 기타)			
비 고			

Daily physical exercise diary

3 주	월 일 요일	
운동시간		
오늘 얼마나 운동하셨어요?	운동 안함	
	30분 이하	
	30분-60분	
	1시간-2시간	
	2시간-3시간	
	3시간 이상	
운동의 종류		
어떤 운동 하셨어요?	유연성 운동	
	심폐지구력 운동	
	평형성 운동	
	근력강화 운동	
	기타 운동	
비 고		



슈퍼맨운동

나 자신과의 약속

첫째, 나는 열린 마음으로 프로그램에 적극적으로 참여할
것을 다짐합니다.

둘째, 나는 나와 함께 프로그램에 참석하는 분들의 생각을
존중하고 진심으로 경청하며 공감하겠습니다.

셋째, 나는 약속한 시간에 프로그램실에 도착하겠습니다.

넷째, 나는 슈퍼맨운동을 통해 배운 운동을 일상생활 속에서
실천하도록 할 것입니다.


성명: _____ (서명)

일자: _____ 년 월 일




Appendix 8. Institute Director's Permission

기관장 연구 수행 허락서			
연구책임자명	김지연	직위	박사과정생
소 속	서울대학교 간호대학		
연구과제명	재가 치매노인 가족부양자를 위한 운동프로그램 개발 및 효과평가		
연구기간	2019. 7. 1. ~ 2020. 12. 31		
연구대상	치매노인 가족부양자	모집인원 (최대)	60명
연구방법	<p>본 연구는 치매관리사업에 등록하고 이용하는 치매환자의 가족부양자를 대상으로 프로그램 참여를 원하는 대상자에게 8주의 통합적 운동프로그램을 적용할 예정이다. 각 주차별 교육 시간은 60분이며 모든 프로그램의 진행은 서울대학교 간호대학 박사과정생 김지연이 실시하도록 한다. 실험군의 중재기간동안은 대조군에게 별도의 프로그램을 시행하지 않고, 중재기간이 끝난 후 간소화된 운동프로그램을 제공할 것이다. 대상자들에게 중재 사전·사후로 설문조사를 할 예정이다.</p>		
<p>본인은 상기 연구를 진행하는 것을 허가합니다.</p> <p>2019년 7월 10일</p> <p>기관명: 고양시 일산서구보건소</p> <p>기관장: 일산서구보건소장</p> <p>서울대학교 생명윤리위원회 귀중</p>			


기관장 연구 수행 허락서			
연구책임자명	김지연	직위	박사과정생
소 속	서울대학교 간호대학		
연구과제명	제가 치매노인 가족부양자를 위한 운동프로그램 개발 및 효과평가		
연구기간	2019. 7. 1. ~ 2020. 12. 31		
연구대상	치매노인 가족부양자	모집인원 (최대)	30명
연구방법	<p>본 연구는 치매관리사업에 등록하고 이용하는 치매환자의 가족부양자를 대상으로 프로그램 참여를 원하는 대상자에게 8주의 통합적 운동프로그램을 적용할 예정이다. 각 주차별 교육 시간은 60분이며 모든 프로그램의 진행은 서울대학교 간호대학 박사과정생 김지연이 실시하도록 한다. 실험군의 중재기간동안은 대조군에게 별도의 프로그램을 시행하지 않고, 중재기간이 끝난 후 간소화된 운동프로그램을 제공할 것이다. 대상자들에게 중재 사전·사후로 설문조사를 할 예정이다.</p>		
<p>본인은 상기 연구를 진행하는 것을 허가합니다.</p> <p style="text-align: right;">2019년 8월 13일</p> <p style="text-align: right;">기관명 : 미추홀구치매안심센터</p> <p style="text-align: right;">기관장 : 배 제 남</p> <div style="text-align: right;">  </div> <p>서울대학교 생명윤리위원회 귀중</p>			

기관장 연구 수행 허락서


연구책임자명	김지연	직위	박사과정생
소 속	서울대학교 간호대학		
연구과제명	재가 치매노인 가족부양자를 위한 운동프로그램 개발 및 효과평가		
연구기간	2019. 7. 1. ~ 2020. 12. 31		
연구대상	치매노인 가족부양자	모집인원 (최대)	60명
연구방법	<p>본 연구는 치매관리사업에 등록하고 이용하는 치매환자의 가족부양자를 대상으로 프로그램 참여를 원하는 대상자에게 8주의 통합적 운동프로그램을 적용할 예정이다. 각 주차별 교육 시간은 60분이며 모든 프로그램의 진행은 서울대학교 간호대학 박사과정생 김지연이 실시하도록 한다. 실험군의 중재기간동안은 대조군에게 별도의 프로그램을 시행하지 않고, 중재기간이 끝난 후 간소화된 운동프로그램을 제공할 것이다. 대상자들에게 중재 사전·사후로 설문조사를 할 예정이다.</p>		
<p>본인은 상기 연구를 진행하는 것을 허가합니다.</p> <p style="text-align: right;">2019년 7월 4일</p> <p style="text-align: right;">기관명 : 의왕시보건소</p> <p style="text-align: right;">기관장 : 임인동</p> <div style="text-align: right;">  </div> <p style="text-align: right;">서울대학교 생명윤리위원회 귀중</p>			

Appendix 9. Permission to Use the Measurement (e-mail)

- Revised – Memory and Behavior Problems Checklist (R-MBPC)

**Linda Teri**
나에게 ▼

You have my permission. Best of luck.


**김지혜**
나에게 ▼

김지연 선생님


R-MBPC 사용하여 좋은 논문 작성하시기 바랍니다.

김지혜 드림

- Self-Rated Abilities for Health Practices (SRAHP)

**Becker, Heather A**
나에게 ▼

Thank you for your interest in the Self-Rated Abilities for Health Practices Scale. You have my permission to use it in your dissertation, but please be aware that it was designed for people with disabilities whose impairments may make it difficult for them to carry out certain health promotion behaviors. When used with people without such constraints, we observed a ceiling effect.

**박지선**
나에게 ▼

김지연선생님!

박사논문을 준비중이신 모양이네요.


척도를 사용하셔도 좋습니다.

학위논문을 쓰다는 건 힘든 과정일텐데 모쪼록 힘내시길 바랍니다.


늘 평안하십시오.

박지선배상.

- Exercise Self-Efficacy Scale (ESES)

**Albert Bandura**
나에게 ▼

Permission granted! AB

**신윤희**
나에게 ▼

네. 사용하십시오.

- Short Physical Performance Battery (SPPB)




Guralnik, Jack
 나에게 ▼

The SPPB was developed when I worked for the National Institutes for Health (NIH) and there is no copyright on it. It can be used for free, without permission. You may want to look at the following web site that I have established. Thank you for your interest in the SPPB.

www.SPPBguide.com

- Korean version of Zarit Burden Interview (ZBI-K)




Le Roux, Brigitte
 나에게 ▼

Thanks for confirming,

The ZBI-22 is available to download free of charge in the requested language: Korean
 This service is only available for non-funded users.
 Please follow the step-by-step tutorial to download the questionnaire:
[Instructions to download a questionnaire](#).

I hope you will find what you need, feel free to reach out if there are any outstanding questions.
 Best regards,




윤진상
 나에게 ▼

김지연 선생님께,

네. 잘 활용하십시오.
 감사합니다.
 윤진상 배

- Geriatric Depression Scale Short Form-Korea Version (GDSSF-K)



Jerome A Yesavage
 나에게 ▼

Scale is public, good luck.

- Perceived stress scale (PSS)



Mind Garden Inc

나에게

Hello,

The author of the Perceived Stress Scale (PSS), Sheldon Cohen, is making the instrument available at no charge to researchers. While Mind Garden is not the publisher, you can download the instrument from our website.

For more info about the Perceived Stress Scale, [please click here](#).
[Download the PSS Form free of charge.](#)

Many questions can be answered on [Sheldon Cohen's personal website](#) and all questions should be addressed to

Best regards,

Katherine
Mind Garden, Inc.



Changsu Han

나에게

네. 김지연 선생님,

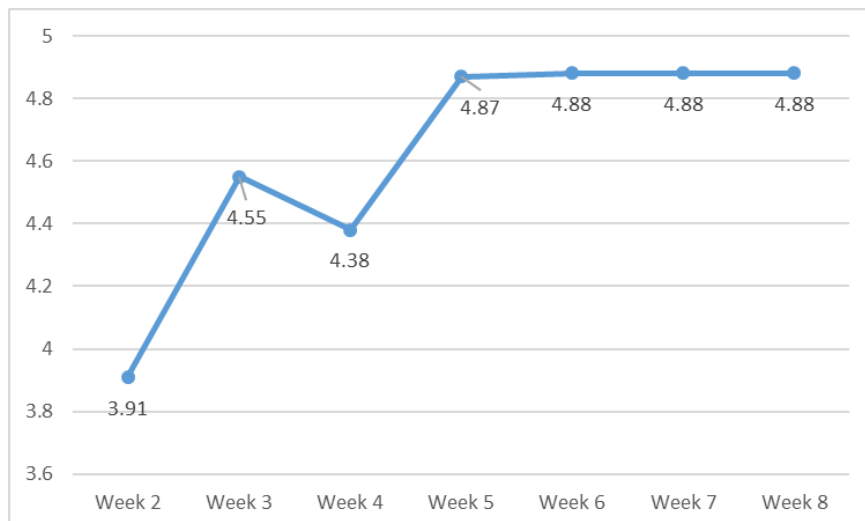
논문 '한글판 스트레스 자가 척도의 신뢰도와 타당도 연구' (2012)의 측정도구
perceived stress scale 한글판을 연구 목적으로 사용하는 것에 대한 저자 승인을 합니다.
좋은 연구 하시기 바랍니다.

You have my permission to use Korean version of Perceived Stress Scale for research purposes.

한 창 수 MD, PhD, MHS
고려대학교 정신건강의학과 교수

Appendix 10. Summary of the Physical Exercise Diary Usage

During the 50 days of PE-SER program, family caregivers of PwD recorded the number of days they exercised. Physical exercise diary usage was categorized into four; high (33-50 sessions), moderate (16-32 sessions), low (8-15 sessions) and very low (0-7 sessions). 21 (61.8%) family caregivers were identified as high, five (14.7%) in moderate, four (11.8%) in low and four (11.8%) in very low. They exercised on average of 33.21 (SD=16.06) days, ranging from 7 to 50 days. The results of weekly average analysis of physical exercise diary usage (number of days of exercise) in the experimental group are shown in Figure 9. From week 2 to week 5, it continuously increases with a slight decline at week 4, however, from week 6 it remained the same till the end of the program.



Average number exercise days per week recorded in the physical exercise diary

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치매 환자 가족 돌봄자를 위한 운동프로그램 개발 및 효과 평가

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치매환자 수가 점점 증가하고, 의료기술과 생활수준의 향상으로 치매 환자의 평균 수명이 연장됨에 따라 부양 기간의 증가와 함께 부양 부담 또한 증가하고 있다. 중등도 이하의 치매환자는 대부분 가정에서 생활하고 있고, 가족들이 돌보고 있다. 주 보호자인 배우자도 대부분 고령이므로, 이들의 신체적 정신적 부담이 점차 가중되고 있다. 치매환자의 건강과 보호자의 건강은 서로 밀접한 관련이 있기 때문에 치매환자 가족보호자의 건강관리를 위한 중재프로그램이 필요하다.

본 연구의 목적은 지역사회에 거주하는 치매환자 가족을 대상으로 운동프로그램을 개발하여 그 효과를 평가하는 것이다. 본 프로그램은 Bandura의 자기효능감 이론을 바탕으로 구성한 후 전문가 집단의 내용 타당도 검증과 자문 내용을 반영하여 개발되었다. 운동프로그램의 효과 평가는 비동등성 대조군 전후 설계로 진행하였다. 연구대상자는 치매안심센터를 이용하는 치매환자 가족 중 만 60세 이상 노인으로 실험군 34명, 대조군 30명으로 총 74명이 연구에 최종 참여하였다. 실험군에게는 주 1회, 60분의 운동프로그램을 8주간 제공하였고, 대조군에게는 기존의

치매안심센터에서 진행하는 프로그램을 이용하도록 하고, 실험군의 프로그램이 종료된 후 자발적으로 참여할 수 있도록 하였다. 운동프로그램은 2019년 10월 22일부터 시작하여 12월 24일까지 진행되었다. 중재 효과를 확인하기 위해 자기관리 자기효능감 척도, 운동 자기효능감 척도, 간이신체활동능력검사, 단축형 자릿 부양부담평가 척도, 한국판 노인 우울 단축형 척도, 한글판 스트레스 자각 척도와 한국판 삶의 질 간편형 척도를 사용하였다. 자료는 SPSS IBM Statistics Program 23.0을 이용하여 서술적 통계, χ^2 test, Fisher's exact test, Independent t-test, Mann-Whitney U-test로 분석하였다.

연구결과 운동프로그램 종료 후 실험군은 대조군에 비해 자기관리 자기효능감 점수 ($p<.001$), 운동 자기효능감 점수($p=.001$), 신체기능 점수($p<.001$)와 삶의 질 점수 ($p=.011$)는 유의하게 증가하였고, 돌봄부담감 점수($p<.001$)와 우울 점수($p<.001$)는 유의하게 감소하여 가설이 지지되었다. 스트레스 점수는 감소하지 않는 것으로 나타나 가설이 기각되었다.

결론적으로 본 운동프로그램은 지역사회에 거주하는 치매환자 가족들을 대상으로 적용하였을 때 신체적 및 정신적 건강을 증진시키는 효과를 가져왔기에 실무에서 적용 가능한 중재프로그램으로 확인되었다.

주요어: 치매, 가족, 노인, 운동, 자기효능감

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